CTE Course Strands and Standards Drafts for Approval

SY26-27

Career Clusters:

Advanced Manufacturing and Engineering – No Updates

Agriculture - No Updates

Arts, Entertainment and Design

Business Management and Entrepreneurship

Construction

Digital Technology

Education – No updates

Energy and Natural Resources - No Updates

Financial Services – included in the Business Cluster

Healthcare and Human Services

Hospitality, Events and Tourism

Marketing - included in the Business Cluster

Public Service and Safety

Supply Chain and Transportation

Arts, Entertainment and Design

Broadcasting & Digital Media		
Course Code	**Course**	**Changes**
35.02.00.00.009	Digital Media 1	Updated the succession of Digital Media 1 and 2 to better fit Digital Meida Advanced and Digital Media Capstone that we implemented this year.
35.02.00.00.010	Digital Media 2	Updated the succession of Digital Media 1 and 2 to better fit Digital Meida Advanced and Digital Media Capstone that we implemented this year.

STRANDS AND STANDARDS
DIGITAL MEDIA 1

Learning that works for Utah
CTE®

Course Description

Digital Media 1 is the first semester of a foundational course in digital media production and design. Students will explore the process of analyzing, designing, and developing a variety of digital assets using text, graphics, and digital imaging across multiple formats. This course introduces essential concepts and tools used in the graphic design industry, providing students with the core skills needed to begin creating professional-quality media. It also serves as a launchpad for multiple career pathways, including Digital Media, Graphics and Printing, 3D Animation, and Game Development.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	35.02.00.00.009
Concurrent Enrollment Core Code	35.02.00.13.009
Prerequisite	None
Skill Certification Test Number	560 You can also view the test chart HERE for industry exams
Skill Certification Cut Score	**76%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Multimedia
Endorsement 2	Commercial Art
Endorsement 3	Production Graphics
Endorsement 4	Business & Marketing (CTE/General)
Endorsement 5	Business & Marketing L2 Info Management

STRAND 1

Students will understand the design process.

Standard 1

Understand the process of planning a document.

- Research your project (audience, purpose, timeline, page arrangement, and production method)
- Brainstorming
- Creating thumbnails / sketches
- Feedback / revisions

Standard 2

Understand copyright rules and regulations

- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media
- Understand the difference between royalty-free and copyrighted images and text
- Understand the process of obtaining and citing permission for copyrighted works

Standard 3

Explore generative artificial intelligence and its effects on the digital media industry

- Explore intellectual property and copyright implications
- Understand the importance of transparency and communication with use of AI

Performance Skills

Students will be able to plan a project using the proper copyright rules & regulations.

STRAND 2

Students will understand color theory and the principles and elements of design

Standard 1

Understand the proper use of color in publications.

- Understand the difference between the two basic color modes CMYK for print and RGB for screen
- Create variations of color using tint, patterns, gradients, and opacity
- Understand how Bit Depth affects color availability (i.e. 8-bit, 16-bit, 32-bit)

Standard 2

Color Theory

- Recognize and apply color modes for web-based graphics and printed graphics; including RGB, CMYK, and grayscale
- Recognize and apply the following color properties: hue, saturation, and value, including tint and shade
- Recognize and apply color schemes: (complementary, analogous, monochromatic, and triadic)
- Develop a basic understanding of the color wheel
- Understand that colors are used to communicate a mood or message

Standard 3

Understand the principles and elements of design.

- Identify and utilize the following principles of design: formal balance/symmetrical, informal balance/ asymmetrical, contrast, emphasis, movement, unity
- Identify and utilize the following elements of design: line, shape, value, texture, color, positive space, negative space, form

Performance Skills

Students will apply color theory principles.
Students will be able to use the elements & principles of design.

STRAND 3

Students will understand principles of typography.

Standard 1

Identify typeface classifications and their uses, including Serif, Sans-serif, Script, Decorative, etc.

Standard 2

Know and apply the following concepts:

- Understand that fonts are grouped together in families and given a family name (i.e. Arial, Garamond)
- Utilize the three basic categories of type styles, including normal, bold, italic
- Understand copyfitting techniques, such as leading, kerning, tracking, alignment, point size
- Understand basic text alignment, such as left, right, centered, and justified

Performance Skills

Students will apply basic typeface design principles.

STRAND 4

Students will understand and create vector graphics.

Standard 1

Know basic operations of tools, panels, and menus in a drawing/illustration application (i.e. Adobe Illustrator, lnkscape, Affinity Designer, etc.).

Standard 2

Understand, create, and manipulate vector graphics.

- Identify vector graphic formats and their appropriate use (e.g., PDF, Al, EPS, etc.)
- Operate drawing tools to create and manipulate paths, like Bezier curves, using anchor points and direction handles
- Define and apply stroke properties, such as weight and style
- Define and apply fill properties, such as gradient and opacity
- Utilize appropriate selection tools
- Perform grouping and ungrouping of objects
- Transform objects while constraining proportions
- Create and manage layers
- Use of various type tools
- Understand output formats and properties based on project needs when exporting
- Understand basic keystroke and shortcut keys

Performance Skills

Students will create and modify vector images.

STRAND 5

Students will understand and create raster images.

Standard 1

Know basic operations of tools, panels, and menus in a painting/photo editing application (i.e. Adobe Photoshop, GIMP, Affinity Photo, etc.).

Standard 2

Define, create, manipulate, and appropriately use pixel-based raster graphics.

- Identify raster graphic formats and their appropriate use (e.g., JPG/JPEG, GIF, TIFF, BMP, PSD, PNG, etc.)
- Acquire image assets through various means
- Set project requirements based on where the project will be seen, such as print at 300 ppi or screen 72 at ppi.
- Crop, resize, straighten, and transform an image
- Use layers, masks, and selection tools
- Apply filters and effects
- Adjust color and contrast properties
- Create and manipulate gradients
- Apply restoration tools
- Utilize appropriate selection tools
- Utilize various painting and drawing tools
- Understand output formats and properties based on project needs when exporting
- Practice basic keystroke and shortcut keys

Performance Skills

Students will create and modify raster images.

STRAND 6

Students will understand project management and collaboration

Standard 1

Understand and practice project management skills.

- Practice asset and file management using folders and naming conventions.
- Understand file size and storage methods.
- Understand the importance of back-ups and iterations.

Standard 2

Develop an awareness of digital collaborative technologies.

- Explore collaborative technologies, such as Google Drive, Dropbox, Zoom, Slack, Microsoft TEAMS, etc.)

STRAND 7

Students will explore career opportunities and demonstrate understanding of employability competencies.

Standard 1

Develop career skills related to working in the digital arts industry, including social media.

- Identify occupations related to digital media careers.
- Identify knowledge and skills necessary for careers in digital media.
- Identify post-secondary opportunities in digital media.

Standard 2

Demonstrate workplace skills.

- Collaborate within a team
- Develop employable competencies and characteristics: responsibility, dependability, ethics, respect, and cooperation.
- Understand the purpose and consequence of the message within your media.
- Evaluate information critically and competently

Performance Skills

Create and finalize a professional portfolio with projects completed during this course. Portfolio should demonstrate a progression of skills.

Skill Certification Test Points by Strand

This will be updated once the test has been revised.

STRANDS AND STANDARDS
DIGITAL MEDIA 2

Learning that works for Utah
CTE®

Course Description

Digital Media 2 is the second semester of the first-year digital media course sequence, expanding students' creative and technical skills in media production. In this course, students will design and develop digital projects using animation, video, and audio elements. They will explore industry-standard tools and techniques to produce compelling multimedia content across various formats. This course provides foundational knowledge of the media production industry and serves as a gateway to multiple career pathways, including Digital Media, Film Production, Animation, and Game Development.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	35.02.00.00.010
Concurrent Enrollment Core Code	35.02.00.13.010
Prerequisite	Digital Media 1
Skill Certification Test Number	811 You can also view the test chart HERE for industry exams
Skill Certification Cut Score	**74%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Multimedia

Updated: August 2025

STRAND 1

Students will understand the production pipeline in the creation of digital media projects.

Standard 1

Pre-Production

- Story / Script
- Storyboard
- Production Schedule

Standard 2

Production

- Correct use of equipment
- Follow pre-production plans such as script, storyboard, and production schedule
- Capture and create digital content

Standard 3

Post-Production

- Edit captured and created content
- Understand output formats and properties based on project needs
- Students will understand publishing and distribution of final projects

Performance Skills

Students will implement the production pipeline in the creation of digital media projects.

STRAND 2

Students will plan, produce, edit, and publish digital audio.

Standard 1

Plan and create digital audio

- Prepare a script and record audio
- Capture audio from an original or existing source
- Understand clipping, stereo, and mono
- Recognize and use appropriate types of sound such as voice over/narration, music, sound effects/foley, etc.

Standard 2

Edit digital audio

- Edit sound
- Apply special effects to audio files
- Understand and manipulate frequency, amplitude, decibel, pitch, sample rate, bit depth, wavelength, and hertz

Standard 3

Export and publish digital audio

- Identify different audio formats and containers such as WAV, MIDI, MP3, AIFF, AAC, MP4, M4A, WMA, FLAC, etc.
- Understand quality differences between audio formats
- Add, edit, and manipulate metadata
- Export and convert audio into different formats
- Publish an audio project

Performance Skills

Students will produce a complete audio project.

STRAND 3

Students will plan, produce, edit, and publish 2D animations.

Standard 1

Plan an animation project.

- Create animation script and storyboard
- Introduce basic story elements, such as setting, pacing, plot, and resolution.

Standard 2

Create and manipulate animations.

- Perform changes to position, scale, color, and properties of an animated object.
- Create Keyframe and Frame-by-Frame animation
- Create, import, and utilize assets
- Publish an animation project
- Recognize and apply major principles of animation such as squash and stretch, anticipation, timing, staging, etc.

Performance Skills

Students will produce an animation project.

STRAND 4

Students will plan, create, edit, and publish digital video

Standard 1

Plan Video Project

- Create script, storyboard, and shot list
- Define crew member roles, such as Producer, Director, Cinematographer, Editor, Sound Engineer, Talent, etc.

Standard 2

Create Video Project

- Use video equipment, such as tripod, microphone, lights, camera
- Demonstrate proper shooting techniques, such as camera settings, composition, and lighting
- Demonstrate a variety of camera shots and angles, such as Close-up, Medium, Wide, Extra Wide, Extreme
- Follow pre-production plans such as script, storyboard, and shot list
- Close-up, Worm's Eye, and Bird's Eye

Standard 3

Edit and publish video project

- Identify different video formats and codec such as MP4, MOV, AVI, H.264, etc.
- Understand differences between aspect ratios (16:9 and 4:3) and resolution (1920 x 1080 and 640 x 480)
- Use video editing techniques, such as transitions, effects, titling (safe area), credits, etc.
- Recognize and use video settings, such as frame rates, compression, and resolution
- Export and convert video into different formats
- Publish a video project

Performance Skills

Students will produce a video project.

STRAND 5

Students will explore career opportunities and demonstrate understanding of employability competencies.

Standard 1

Develop career skills related to working in the digital arts industry, including social media.

- Identify occupations related to digital media careers
- Identify knowledge and skills necessary for careers in digital media
- Identify post-secondary opportunities in digital media

Standard 2

Demonstrate workplace skills.

- Collaborate within a team
- Develop employable competencies and characteristics: responsibility, dependability, ethics, respect, and cooperation.
- Understand the purpose and consequence of the message within your media
- Evaluate information critically and competently

STRAND 6

Students will design and develop a digital portfolio.

Standard 1

Create a digital portfolio adhering to copyright and Fair Use Guidelines of the student's best work.

- Include individual and group projects in animation, video, and audio
- For group projects, identify responsibilities and aspect of the project that the individual student created
- May include cross-curricular content

Standard 2

Publish digital portfolio

- Explore various publishing methods.

Performance Skills

Students will produce a digital portfolio in combination with their work from Digital Media 1 that demonstrates the students' abilities in raster graphics, vector graphics, animation, audio, video, and group work.

STRAND 7

Students will be able to understand and practice copyright laws, ethics, and legal issues.

Standard 1

Define copyright, public domain, fair use, creative commons, and ethics.

Standard 2

Practice ethics and rules governing digital media work.

- Fair use
- Time limits
- Copying and distribution limits

Standard 3

Explore generative artificial intelligence and its effects on the digital media industry

- Explore intellectual property and copyright implications
- Understand the importance of transparency and communication with use of AI

Skill Certification Test Points by Strand

This will be updated after the test is revised.

Business Management and Entrepreneurship

Course Code	Course	Changes
32.02.00.00.110	Business Communications 1	Edited the description, added definitions to the Strands and Standards, Switched the order of the strands and standards, Added in written communication ethical uses of AI and instant messaging in business. In listening added virtual meeting etiquette.
32.02.00.00.111	Business Communications 2	Changed the course to be applicable to many industry communication needs. The course should begin by explaining the communication portfolio and how each student can customize it to explore careers that they are interested in. Emphasis on communication to gain employment.
37.01.00.00.150	Business Leadership 1	Adding better definitions and descriptions throughout strands and standards changed the order of the strands and standards. Changed leadership roles to high-performing teams, added in Tuckman's team & group development model, switched Strand 7 to a Business Pathways exploration.
37.01.00.00.155	Business Leadership 2	Order of the strands and standards where changed to have a better flow of topics. Removed repetitive aspects from the previous version of the course.
32.01.00.00.165	Marketing 1	Shorten the strands and standards to better fit within a semester. Condensed some strands and eliminated some standards.
37.01.00.00.240	Retailing	Changed the order of the strands and standards. Add a roles in retail strand to talk about careers more directly. Removed some of the public relations to help keep the course more concise.

STRANDS AND STANDARDS
BUSINESS COMMUNICATION 1

Course Description

Business Communication affects all aspects of our lives. This introductory course will teach students to communicate in a clear, courteous, concise, complete, and correct manner on both the personal and professional levels. Competency will be developed in oral, written, interpersonal, technological, and ethical use of Artificial Intelligence. Listening skills will be incorporated throughout the semester. The overriding goal is to provide students with a solid communication base, so they can communicate effectively in the workplace.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	32.02.00.00.110
Concurrent Enrollment Core Code	32.02.00.13.110
Prerequisite	None
Skill Certification Test Number	220
Skill Certification Cut Score	**73%**
Test Weight	1.0
License Area of Concentration	Secondary Education 6-12
Required Endorsement(s)	
Previous Endorsements	Business, Finance & Marketing (CTE/ General)
Current Endorsements	BFM Communications, BFM (CTE/General)
	BFM Comprehensive

Updated: August 2025

STRAND 1

Effective communication-Students will understand that effective communication results in the receiver understanding the intended message.

Standard 1

Recognizing the purpose of a message

- **Political:** a message intended to influence a decision of political purpose and/or pertains to an issue of public policy.
- **Commercial**: that promotes or advertises a product or service.
- **Networking**: is intended to gain a relationship through sharing ideas, information, and messages.
- **Personal**: a private form of communication, only seen and accessible by users participating in the message.
- **Educational**: a more formal message that is intended to inform, instruct, and enhance learning.

Standard 2

Understand and identify how audience and situation affect style and tone.

- Recognize when to use communication channels based on the audience and situation.

Audience

- Friends: Informal
- Boss/Supervisor: A combination of both formal and informal.
- People you supervise: Formal

Types of Situations

Formal

- Boardroom: Use Parliamentary Procedures. How to call for a motion, take minutes, keep the language formal, and keep topics diplomatic and polite.
- Hiring & Resignation: Uses industry language and a professional tone.

Informal

- Networking Event: Often with an unfamiliar audience. In-Person events. Putting your best foot forward, having an elevator pitch on who you are and why you are there. Often, a time for sharing contact information.
- Breakroom talk: Familiar can be fun and friendly, but often is used for interoffice politics or discussion of pop culture and non-work topics.

Standard 3

Barriers to effective communication

- Identify barriers to communication.
  - **Organizational barriers**: the hindrances in the flow of information among the employees that might result in the message not being received completely.
  - **Physical barriers**: an element or a physical factor that acts as a distraction to hinder the flow of communication (noisy rooms, or communication from a distance).
  - **Physiological barriers**: the limitations of the human body and the human mind (memory, attention, personal discomfort, and speech).
  - **Language barriers**: Obstacles like a lack of knowledge of a specific language obstructs communication.
  - **Cultural barriers**: an issue arising from a misunderstanding of meaning, caused by cultural differences between sender and receiver.
  - **Perceptual barriers**: psychological barriers prevent the individual from accurately understanding the messages being conveyed to them. It can include stereotypes, preconceptions, biases, and personal opinions.

- **Technological barriers**: any miscommunication caused by technology integration, slow internet, lack of training on technology, or other technology-based interferences.
- Use bias-free language to develop responsible ways of thinking and acting. **Bias-free language** does not discriminate and therefore includes all audience members in a fair and friendly manner.

Performance Skill

Create a presentation on any subject that shows the following

- Clearly identified audience and/or a situation
- Tailor a presentation to an audience.
- Use bias-free language.
- Demonstrate a communication barrier in business.

STRAND 2

Non-Verbal Communication

Students will identify and demonstrate effective non-verbal communication.
Effective communication includes recognizing non-verbal cues, choosing the message, and recognizing barriers to communication.

Standard 1

Compare and contrast the effect of nonverbal communication on the sender and receiver.

Nonverbal communication is the transfer of information through the use of body language, including eye contact, facial expressions, gestures, and more.

Recognize the effect of nonverbal communication

- **Facial Gestures**
  - Emotions: Anger, Sadness, Joy, Surprise, Fear, Frustration, Confusion, Boredom, Disgust, and Neutral
- Hand gestures
  - That regulate, manage, contradict, and substitute interactions (thumbs up, okay, pointing, shushing, and waving)
- Body language
  - Proximity
  - Posture
  - Poses
  - Approach
- **Mannerisms**: something a person does repeatedly with their face, hands or voice that they may not realize that they do.
- Eye contact
  - Engages and shows interest, attentiveness, and concern for both the sender and receiver. Increases understanding
  - Too much eye contact can be inappropriate or creepy.

How appearances (visual aids and dress, for example) impact a message

- What you wear matters and conveys a message
- You don't get a second chance for a first impression
- Share examples of Business dress
  - Business Formal
  - Business Casual

Performance Skill (choose one)

Demonstrate nonverbal communication. This includes the following:

- Practice nonverbal forms of communication.
- Demonstrate how altering non-verbal communication can change a message.

STRAND 3

Public Speaking Skills

Students will develop and practice effective spoken communication skills.

Spoken communication refers to the production of spoken language to send an intentional message to a listener, especially in contrast to using non-verbal communication.

Standard 1

Explain the correct use of the following components/characteristics of spoken language.

- **Pronunciation**: how you say a word. This includes emphasizing different syllables, words, or phrases. Pronunciation can vary based on geography or tradition.
- **Enunciation**: to pronounce a word clearly, articulating every syllable of the word.
- **Tone**: the inflection, rise, and fall of the sound, such as sending a question in a higher pitch. Often conveys specific emotions to the listener. It can include volume.
- **Cadence**: the rhythmic flow of a sequence of sounds or words, including pauses. When presenting, individuals should seek to eliminate filler words.

Standard 2

Explain how to create an effective spoken presentation or speech

Preparation

1. Prepare thoroughly and plan your message
2. Consider your audience

Practice

3. Rehearse your presentation, and consider video recording the presentation.
4. Avoid reading your presentation
5. Dress appropriately

Delivery

6. Introduce yourself and your topic
7. Speak clearly, using projection to reach the back row
8. Have confidence, make eye contact, and use your space
9. Be careful with filler words
10. Summarize and end strong
11. Be prepared to answer questions

Performance Skills

Practice and use oral communication skills. This includes the following:

- Plan and present short presentations
- Analyze a professional/famous speech
    - Evaluate cadence, enunciation, pronunciation, and tone

STRAND 4

Written Communication

Students will produce effective written communication documents.

Standard 1

Use digital tools to identify and correct common grammatical errors

- Misspelled and misused words
- Run-on sentences or fragments
- Proper capitalization (proper nouns, I, start of sentences)
- Improper punctuation (when to use semicolons, colons, commas, and periods)

Standard 2

Use **effective writing** to produce instant messaging and emails appropriate to the task, purpose, and audience.

Instant Internal Messaging (Examples: Teams, Slack, and Google Chat)

- Short, direct, and appropriate to the audience
- For instant or immediate use
- Still professional in nature and tone
- Can be reviewed and referred to

Email Communication

- Describe the appropriate usage of Reply, Reply All, and Forward
- Define and describe the use of CC and BCC
- Demonstrate and practice effective subject lines
- Provide examples of salutations and openings of an email
- Use the correct tone and professionalism (etiquette) for the audience and the intended message

Types of Emails

- Explain when to use and how to compose the following emails
  - every day/routine/good news
  - sales/persuasive (Attention, Interest, Desire, and Action)
  - bad news/refusal messages (Buffer, Details, Bad News, End with Positive)
  - thank you note/follow-up
- Identify the appropriate use of a complimentary close
- Explain the use of e-mail attachments
- Describe the importance of editing (read it through) before publishing/sending
- Share the appropriate response time to emails, typically 24 to 48 hours
- Describe the actions needed for inbox management

Standard 3

Know how to access and select the appropriate templates for document design

- Explore available **templates** - in Google, Microsoft, or other web resources
- Understand the importance and need for document layout
- Know which templates will enhance your message
- Using brand or corporate-specific templates and style guides

Standard 4

Describe the ethical use of **Artificial Intelligence**

Artificial Intelligence Programs: a set of technologies that enable computers to perform a variety of advanced

functions. It reacts in ways that would usually require human intelligence.

- Ensure accuracy by checking sources or providing them to AI
- Edit responses to add personal tone and examples
- Appropriate for idea generation and brainstorming
- Not appropriate to substitute for your own knowledge and writing
- Each institution and corporation will most likely have an **AUP (Acceptable Use Policy)** for when to disclose that AI was used.

Explain the life of data when using Artificial Intelligence

- Be aware that any documentation or data uploaded into a prompt is then property of the public domain
- Co-Pilot and Gemini allow for privacy settings to maintain company ownership and safety.

Prompt Engineering and AI

Prompt Engineering: the process of providing instructions to an AI program to produce the desired output.

- Explain that AI learns from the prompt engineer or user
  - Tone
  - Word Usage
  - Emotion
  - Professionalism
  - Formatting
  - User preferences

Performance Skill (choose 2)

Students will demonstrate their understanding of effective written communication

- Compose and send either a good news, a persuasive, a thank you, or a bad news email
- Have students evaluate an email or another piece of writing, looking for grammar, purpose, audience, and layout.
- Explore AI and prompt development when composing written communication

STRAND 5

Listening Skills

Students will develop and practice **proficient listening skills** in the workplace, including in-person, phone, and video calls.

Standard 1

In-person listening skills

Explain how to listen attentively in business situations

- Take accurate notes, include assignments and action items
- Follow directions
  - Ask clarifying questions
  - Provide feedback and paraphrase the message
- Pay attention
  - Make eye contact
  - Exhibit other non-verbal cues, such as nodding and smiling

Standard 2

Demonstrate the proper use of telephone etiquette

- Speak clearly and take part in the conversation
- Leave effective messages including contact information- spoken slowly
- Reply to messages promptly

Standard 3

Demonstrate the proper use of video call etiquette

- Establish norms for the meeting
  - Cameras on
  - Microphones muted
  - Raise the hand icon when you want to speak
  - Beginning and ending on time
- Speak clearly and take part in the conversation
- Be aware of your background
  - Consider background noises
  - Choose an esthetically pleasing or non-distracting environment
- Be courteous- professional in chat, not texting during meetings, etc.

Performance skill (choose one)

Students will practice listening skills.

- Watch or participate in a business meeting and take notes
- Practice following oral directions and taking notes.
- Demonstrate proper phone technique.

Insustry Test Points by Strand

Test Name	Test #	1	2	3	4	5	Total Points	Total Questions
Businee Communication 1	220	X	X	X	X	X	37	35

STRANDS AND STANDARDS
BUSINESS COMMUNICATION 2

Course Description

This advanced course can be used to build on the skills acquired in Business Communication 1 or used as a stand-alone class that focuses on additional methods of professional communication skills. Competency will be developed in oral, written, interpersonal, technological, and employment communication, and listening skills will be incorporated throughout the semester. The goal is to provide students with a practical, proficient portfolio consisting of a cover letter, resume, and follow-up letter. Additionally, students will create either a presentation or a talk to present. Students will complete the course with a greater understanding of the impact of social media and the need for effective communication skills to advance in a business career.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	32.02.00.00.111
Concurrent Enrollment Core Code	32.02.00.13.110
Prerequisite	None
Skill Certification Test Number	222
Skill Certification Cut Score	**76%**
Test Weight	0.5
License Area of Concentration	Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Business, Finance & Marketing (CTE/General)
Endorsement 2	Business, Finance & Marketing Essentials
Endorsement 3	N/A

Updated: August 2025

"Begin with the End in Mind," (Stephen Covey, The 7 Habits of Highly Effective People)
Each student will end this course with a portfolio of sample work for Business communication. Including but not limited to the following **Performance Skills**.

- Cover letter for an application for a chosen job or career
- Create a LinkedIn profile
- Resume
- Follow-up email or thank you letter
- Mock Interview (Recorded)
- Presentation (Recorded)
- Summary of Informational Text

STRAND 1

Communication in Careers
Students will learn communication skills to be successful in a chosen career path.

Standard 1

Explore high-wage, high-demand careers using resources like YouScience Brightpath and the Utah DWS website. Look for 3-5 star careers.

- Explore career options to help students choose a career pathway for their capstone project by the end of this Strand.
- Understand the connection between CTE High School, College, and Career Pathways, specifically as they relate to Business Communication careers and other classes offered related to these Pathways.
    - Describe the Utah pathway(s) that Business Communications is currently included in.
        - Utah CTE Pathways
        - Explore UTech, Utah's technical college network, to identify technical colleges and local digital marketing programs.
        - Explore what opportunities are available for Utah high school seniors.

Standard 2

Determine skills and experience needed for a specific career path.

- Identify industry exams, licenses, and certifications needed for a career.
- Students can gain their first credentials or Industry certifications that highlight the skills they have through Google, MOS, ADA, CS/IT, Adobe, Data Analytics, Digital Marketing, and MTA industry exams.

Standard 3

Determine the Education and/or Certification programs offered in Communication (ex. public relations).

- Identify secondary certifications and/or degrees needed for these types of careers.
    - USHE Utah System of Higher Education. Highlight the current BS or BA opportunities in Business or Communications
    - Teach students the importance of emerging social media sites like LinkedIn in verifying communication skills.

Performance Skill

- Research and start a cloud-based or digital portfolio for a chosen career path. The portfolio should include a means to gather necessary information, resumes, job descriptions, and other job-related documents for your career.
- Create an infographic that identifies a career and the education or training to get to that career. Be sure to include starting and average salary, and schools or universities that provide the training,

required skills, or certifications.

STRAND 2

Reading Strategies

Students will demonstrate effective informational reading strategies necessary for success in their career path. Possible resources include using the Utah Online Library in order to find credible information.

Standard 1

Use basic evaluation techniques to find and use a variety of credible and reliable sources of information. Selecting the most appropriate information to include in your sources (CRAAP)

- **Currency**: How recent the information is
- **Relevance**: How important the information is for your needs
- **Authority**: The source of the information, including the author, publisher, and sponsor
- **Accuracy**: How reliable, truthful, and correct the information is
- **Purpose**: The reason the information exists

Standard 2

Understand how to use and apply the information from various articles, websites, blogs, and other industry publications to a chosen career path.

- Summarize the main ideas of the information sources
- Explore trends and the effect of AI on an industry
- Identify the various ways an industry communicates information to its stakeholders.
  - Blogs
  - Social Media
  - Infographics
  - Formal reports or documents
  - Professional journals and periodicals

Standard 3

Explain strategies for reading and interpreting graphs, charts, tables, and other non-textual diagrams.

- Identifying the X and Y axis and what they represent
- Understanding the legend of the chart
- Labeling information to display meaning
- Looking for patterns and trends in information
- Chunking information together
- Using pictures where relevant to increase understanding

Performance Skills

- Read and analyze three different industry publications
  - Summarize each article
  - Report on any biases that you can see
  - Compare the motivation of each article
  - Determine the key points to be able to report either verbally or in writing.

STRAND 3

Conversation Skills

Students will understand the importance of formal and informal conversation in business communication.

Standard 1

Describe situations in a work environment that require professional conversation.

- Explain how to have a difficult conversation when (hiring, firing, asking for a promotion, hygiene issues, colleague conflicts, giving a positive no, resigning from a job, and managing an unhappy customer/ employee.)
- Discuss the importance of preparing for a difficult conversation and listening to the other person.
  Three C's of Difficult Conversations
  - **Confidence**: Do not apologize, know your points while speaking with calm conviction.
  - **Clarity**: Be direct and specific by summarizing, restating decisions, expectations, and deadlines.
  - **Control**: Stay emotion-free while still showing empathy and understanding for the other person.
- Describe how biases impact communication and perspective in understanding
  - **Biases**: preconceived notions or judgments that can influence how messages are sent and received
- Differentiate between formally requesting time off and providing a two-week notice to an employer, which is ideally done through formal email or written letter.
- Discuss when to have conversations in person, through text, or by email.

Standard 2

Explore the business/professional situations that require communication, and evaluate appropriate communication.

Develop ways to improve listening, notetaking, and observing skills, and give verbal feedback to engage in each situation

- **Small talk**: informal break room talk, introductions, or group gathering moments with supervisor, colleagues, and customers.
- Discuss negative conversation types that are not conducive to group conversations.
  - Interrupters
  - Rambling
  - Repeaters
  - Negative Talk
  - Poor Body language
  - The one upper
  - Narcissistic tendencies
- **Customer relationship interaction**: remembering customer names and details
- **Impromptu summary**: Without prior notice, express your opinion thoughtfully, and summarize current issues succinctly.
- Reporting to or **receiving a report/feedback** from a supervisor
  - When giving feedback, use the sandwich method: positive, negative, positive.
  - Prepare questions from your feedback, training, or future career goals.
  - Keep a paper trail of comments and any formal professional feedback.
  - Report back on goals in a timely manner or request a timeline if one was not given.
- **Business dinner or reception**: more formal conversations with business partners or clients. The goal is to make a positive impression, avoiding controversial topics.
- Illustrate how to prepare for a board meeting or formal presentation.
  - Have a prepared presentation with details planned and listed in a handout or a slideshow.

Performance Skills

- Role play professionally handling a difficult situation (mass layoff, product recall)
- Students will demonstrate formal or informal communication (participation in a CTSO role play, creating a fictional scenario)

STRAND 4

Employment Communication

Students will explore the appropriate communication tools and strategies for securing employment.

Standard 1

Understand the importance of tailoring an employment resume to match a specific job description

- **Job Posting websites**: a site used by employers to advertise their job vacancies to job seekers.
  - Examples: Jobs.utah.gov, Monster.com, Snagajob, Indeed.com, Glassdoor, Simplyhired, and LinkedIn.
- **Job Description**: published notice of employment opening including lists of duties and experience required.
- Adapting a resume to include keywords from the job description to aid in the screening of applicants.
  - **Keywords**: specific words from the job description that an employer will use to filter applicants.

Standard 2

Students understand that a professional resume communicates their skills and verifiable experiences.

- **Templates**: a digital tool that provides a structure for resumes, cover letters, and other business documents
- **Professional profiles/ networking sites**: include your name, professional profile photo, summarize your work history/story, list your skills, and ask connections to endorse your skills, network with/follow others.
- **Resumes Essential Components**: Contact information, Work experience, Education Experience, and at least 1 of the following (Skills and Certifications, Personal Interest, Awards) to fill one page.
- **References Sheet**: a separate document that contains names, contact information, and relationship length and description. Non-family members!
- **Requesting a letter of recommendation (LoR):** for employment or scholarships, which should include:
  - Job description, employer name, or position
  - A timeline of when you need LoR
  - Keywords to use within the LoR
  - Examples and experiences you have had with the recommender

Standard 3

Explore the importance of an effective cover letter and follow-up letter in the ability to secure employment

- **Cover letter essentials**:
  - **Consistent formatting with resume**: this includes fonts and header styles with contact information.
  - **Introduction**: Where the potential employee briefly describes themselves.
  - **Employee Skills**: should be matched to the job description and give specific details.
  - **Fit**: employee beliefs and values align with the business culture and mission
  - **Ask**: Request an interview and explain how to best contact you
- **Follow-up letter essentials**:
  - Thank the employer for the interview
  - Reminder of fit: why you are an ideal candidate
  - Future looking: how to contact you for further information

Standard 4

Understand he process for effective job interviews

- Informal job interviews
  - **Networking**: Interacting with others to exchange information and develop professional/ social contacts.
  - Professionally complete a written or electronic job application form
- Interview Essentials:
  - **Research the company**. Applicants should know their product/service, and understand the company values and culture (including dress)
  - Prepare answers to common interview questions (identify ones common to each chosen career path)
  - Prepare a list of **questions to ask** at the end of an interview. Should be related to the company's mission, vision, values, the fit, and ask.
  - Avoid **common mistakes** made by applicants such as improper dress or grooming, looking at your phone, chewing gum, sharing too much personal information, answering questions too briefly, not doing research on the company, inquiring too soon on pay, or vacation time off.
  - Arrive early
  - Find a way to stand out through your experience and education. Be sure to connect it back to the position you are applying for.

Standard 5

Understand the unique aspects of virtual/video interviews and best practices for success.

- **Technology Check**: Test the internet connection, webcam, and microphone beforehand. Ensure good lighting and a clean background
- **Professional Appearance**: Dress professionally, as you would for an in-person interview
- **Eye Contact**: Look at the camera, not just the screen, to simulate eye contact
- **Body Language**: Maintain good posture and body language. Be aware of non-verbal communication
- **Minimize Distractions**: Find a quiet place with minimal interruptions. Silence notifications and close unnecessary tabs/programs
- **Platform Familiarity**: If you know the video platform (Zoom, Teams, etc.), familiarize yourself with it in advance
- **Virtual Etiquette**:
  - Mute when not speaking
  - Wait your turn to speak and avoid interrupting
  - Be mindful of background noise and visual distractions

Standard 6

Describe the importance of maintaining a professional and appropriate social media activity in securing and keeping employment.

- Explain the importance of an online persona: an identity that someone presents online through the activities and interactions they choose to engage in.
- Social media accounts should give the impression that you are a professional and trustworthy potential hire.
- Explain the use of Social media as a common screening practice for future college and career opportunities. Share statistics of screening practices.

Performance Skill **Create an employment portfolio (Required)**

- Create a resume that is tailored to a specific job description
- Write a cover letter to accompany a resume and ask for an interview

- Role-play interviews and demonstrate professional communication
- Research a potential employer and prepare questions to ask about the business
- Record a video of yourself giving an elevator pitch or an introduction to your resume for a potential employer

STRAND 5

Informational Reading

Students will improve and demonstrate effective informational reading strategies necessary to success in the workplace.

Standard 1

Use basic evaluation techniques to find and use a variety of credible and reliable sources of information.

- Date of publication
- Check the sources of the information
- Checking sources for bias
- Determine the motive(s) of the publication, such as political, commercial, educational, or informational
- Verify AI sources to ensure they do not produce hallucinations
  - **Hallucinations**: misleading or incorrect results when using AI tools

Standard 2

Determine key understanding from various articles, websites, blogs, and other publications.

- Summarize the information sources main ideas
- Determine the key points for future communications

Standard 3

Understand how to use the information you have gathered to apply it to the business or organization that they are in.

- Create recommendations on improved practices for the business
- Determine the best way to communicate recommendations from reading

Performance Skills

- Read and analyze three current business articles.
  - Check for bias and determine if the source should be used
  - Compare the motivation of the articles
  - Determine the key points to be able to report either verbally or in writing
  - Summarize information from articles and make recommendations from the information provided

STRAND 6

Sharing Information

Students will understand various formal methods for delivering/sharing knowledge in the workplace.

Standard 1

Demonstrate the ability to present a verbal report in a work environment

- Identify how verbal presentations vary through different industries. Client presentation vs a large audience.

Describe situations and scenarios to create and organize a professional verbal report in a variety of workplace settings

- **Plan & Construct**: (research, outline, and organize) in a well-thought-out and easily communicated

format.

- **Compose**: use correct grammar, spelling, and parallelism in both the presentation and oral report. Reference/Works Cited page with proper citations for sources.
- **Edit**: Practice and revise the presentation after receiving feedback.
- **Present** (See standard 2)

Standard 2

Share an example of a professional presentation.

- Manage public speaking apprehension.
  - Rehearse your presentation
  - Visual guide- slideshow
- Individual challenges in verbal presentations are common
  Share strategies for facing human limitations
  - Paced breathing
  - Repeated practice

Review best practices when giving a professional presentation.

- **Dress appropriately**
- Posture
- **Eye contact**
- Body language, including hand/arm gestures
- **Filler words** such as like, um, so.
- Volume and **enunciation**

Performance Skills

Verbally deliver a five to ten-minute business presentation similar to a podcast or Ted Talk.

Skill Certification Test Points by Strand

Test Name	Test #	1	2	3	4	5	6	Total Points	Total Questions
Business Leadership 2	419								

STRANDS AND STANDARDS
BUSINESS LEADERSHIP 1

Learning that works for Utah
CTE®

Course Description

This class teaches how to be an effective business leader. Concepts include the origins of business leadership, organizational leadership, managing business roles and responsibilities, effective leadership communication, business decision making, motivating employees, and inclusion and diversity in leadership.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	37.01.00.00.150
Concurrent Enrollment Core Code	37.01.00.13.150
Prerequisite	
Skill Certification Test Number	418
Skill Certification Cut Score	**70%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Business and Marketing (CTE/General)
Endorsement 2	Business and Marketing Essentials
Endorsement 3	

Updated: March 2025

STRAND 1

Students will investigate the history, meaning, theory, and styles of leadership.

Standard 1

Leadership Theories

- **Great Man Theory**: Great leaders are born possessing certain traits that enable them to rise and lead. Great leaders can arise when the need for them is great.
- **Trait Theory**: states that leadership qualities can be acquired, however, a good leader has certain characteristics that allow learning the skills to be much easier.
- **Behavioral Theory**: focuses on how leaders behave, and assumes that these traits can be copied by other leaders.
- **Contingency/Situational Theory**: suggests that a leader's effectiveness is contingent on whether or not their leadership style suits a particular situation.
- **Transactional**: is based on the idea that leaders give followers something they want in exchange for getting something they want.
- **Transformational**: where a leader works with teams to identify needed change, creating a vision to guide the change through inspiration, and executing the change in tandem with committed members of a group.
- **Emerging Leadership Approaches** (e.g., Authentic Leadership, Spiritual Leadership, Servant Leadership)

Standard 2

Determine your personal leadership

- Explore personality test that help identify your key leadership traits some suggestions are Meyers & Briggs, Strengthsfinder 2.0, Enneagram, 16 personalities, or Have students take a test and evaluate the relationship between personality and leadership.
- Highlight current business leaders in the 21st century and how they emulate these personality traits.

STRAND 2

Leading Organization with Intention - Students will learn the importance and fundamentals of a vision, a mission, and establishing goals that will help to accomplish the over vision and mission of the organization.

Standard 1

Understand the differences of individual perspectives and its effect on the purpose, benefits, and structure of **Vision Statement** which is a sentence or short paragraph that succinctly describes the goals of a company, nonprofit, or some other entity and a **Mission Statement** that is used by a company to explain, in simple and concise terms, its purpose(s) for being.

- Internal and external slogans and taglines should reflect a condensed version of the vision and mission statement. Highlight examples of corporations and organizations that are successful at doing this.
- Differentiate between the two types of organizational statements and how each is used by organizations.

Standard 2

Explore best strategies to communicate your organization or businesses vision and mission statements to all your **stakeholders** as an individual or group that has an interest in any decision or activity of an organization. Keeping it where everyone can see it on a wall, in your email signature,

- Use multiple communication channels.
- Repeat the vision and mission whenever you are meeting as an organization.
- Create a call out when gathering your organization together.

- Keep it clear and concise

Standard 3

Understand the value of business or organizational goals and the characteristics of a SMART goal.

- Specific: simple, sensible, and significant
- Measured: Meaningful and Motivated
- Achievable: Agreed and Attainable
- Relevant: reasonable, realistic and resourced, results-based
- Time Bound: time-based, time limited, time/cost limited, timely, time-sensitive

Standard 4

Discuss in depth the practices of writing SMART goals and emphasize the concepts of Achievable, It should stretch your abilities but still remain possible and **Relevant**, ensure that your goal matters to you, and that it also aligns with other goals in creating SMART Goals.

- Provide examples of achievable and relevant goals in a organization.
- Limit the number of goals that you are trying to achieve to an attainable amount, no more than 3 at one time.
  Create a cycle of effective planning and reporting your goals within the organization.

Performance Skill

Apply your understanding of SMART goals to an organization you are a part of by creating 3 SMART goals for yourself to complete.

STRAND 3

Organizing Roles & Responsibilities - Students will be able to identify various roles and define the scope of work for each role within an organization.

Standard 1

Evaluate the various leadership positions inside of an organization and define the leadership skills necessary for each role. Explore the 5 levels of leadership to understand that leadership relationships evolve and are also a process to master.

Standard 2

Define the role of leadership in determining the responsibilities of each of the roles within an organization, what job and scope of work does each team member contribute?

- What directives will they be overseeing
- Which deliverables will they be accountable for
- Who will they be asked to manage

Standard 3

Understand the chain of accountability in an organization. Describe how the process of information and communication all ensure that employees know what they should do and who they should report back to.

- **Chain of accountability**: dictates who is in charge of whom and of whom permission must be asked.
- **Workflow**: execution and automation of business processes: where tasks, information and documents are passed from one person to another for action according to a set of procedural rules.
- **Policies**: a principle of action adopted or proposed by a business, or organization
- **Procedures**: an established or official way of doing something in a business
- **Flow of information**: is the movement of information between people and systems.

Performance Skill

- Analyze an accountability chain of an organization OR
- Create a information flow chart for an organization

STRAND 4

Effective Communication in Leadership - Students will understand effective strategies for communication with all stakeholders of the business or organization.

Standard 1

Students will understand formal and informal rules of communication

- Examples of when to use formal communication in a work or professional environment
  - When meeting a new client or customer
  - When addressing your immediate supervisor or person of authority
  - When taking down minutes for a board or presidency meeting
- Examples of when to use informal communication in a work or professional environment
  - When texting a work colleague on the same level
  - When communicating over the phone with someone you know well and call by a first name or an approved nickname.

Standard 2

Students will use effective techniques when communicating with employees or organization members through various communication channels

- Email
- Social Media Post
- Public Relations

Standard 3

Understand tools for effective communication when talking to an employee with a concern or when discussing with your direct supervisor a concern.

- Active listening
- Empathy and validation
- Positive language usage and correct grammar

- No absolutisms: “always” and “never” and avoid saying inflammatory or opinion based comments
- Clarify any confusing ideas by asking questions
- Be respectful in language, tone, and volume level
- Use eye contact and be sure the person can hear you
- Do not interrupt or argue

Standard 4

Compare and contrast “I” and “you” messages.

- “You” Messages:
- “I“ Messages:

Performance Skills

- Practice public speaking by researching a successful leader and communicating why they inspire you.
- Lead a group discussion applying all the active listening and communication skills from this Strand.

STRAND 5

Business Decision Making - Students will understand the process for making sound decisions and resolving conflicts.

Standard 1

Using Parliamentary Procedure to make decisions

- Treat one subject at a time
- Alternate between opposite points of view in discussion
- Always have the chair tally votes for both sides of the issue
- Maintain decorum in discussion and avoiding personalities in debate
- Confine debate to the merits of the question under discussion (PLI 1995:4).
- Division of a question—members may be for one part of a question and not for another

Learn Robert’s rules for running a board or a presidency meeting

- Ensure the right of the majority
- Protect the rights of the minority
- Defend the rights of individual members
- Safeguard those people absent from the meeting four different types of diversity: internal, external, organizational, and worldview
- Guard all these together

Standard 2

Define and discuss the **steps for sound decision making** in order.

- Identify the problem
- Generate alternatives
- Select best solution
- Implement solution

Explore the language used in making decisions during formal business meetings. (create a table)

- “I move to postpone”
- “ Move to adjourn the meeting”
- “ I move to propose a vote”
- “ All in favor say I”
- “All opposed say Nay”

Standard 3

Compare and contrast decision making.

- Individual decision making strategies
  - Pro & Con List
  - T Chart
  - Gantt Chart
- Group decision making
  - Consensus Building
  - Group Think/ Peer Pressure
  - Influence

Performance Skills

- Students will demonstrate using parley procedure while running a meeting. OR
- Students will observe a formal business meeting such as a school district meeting, a PTA meeting, A School Land Trust meeting or other community or city based meetings that are open to the public.

STRAND 6

Motivating Employees - Students will understand the nature of motivating employees and members of a business or organization.

Standard 1

Discuss common **motivational practices**

- Get to know your employees by spending one on one time with them
- Learn what their individual motivation is, not everyone is the same
- Ensure they have what they need to be successful
- Help them develop the skills they desire
- Include employees in decision making
- Believe in them and trust their efforts

Standard 2

Describe the use of criticism and praise in motivating employee behaviors.

- Praise in public
- Provide feedback in private

Standard 3

Delegating

Steps to **effective delegation**

- Choose the right person for the task.
- Explain why you are giving them the task.
- Provide instructions and goals for the outcome.
- Provide any needed resources or training.
- Give them the authority to act.
- Check the outcome with provide feedback and gratitude.

STRAND 7

Diversity and Inclusion in Organizations - Students will identify and understand the nature of diversity within organizations.

Standard 1

Discuss how a leader can encourage diversity within organizations and recognize the benefits of diversity in thoughts, ideas, experiences, race, traditions, philosophies, skills.

- Four different types of diversity: internal, external, organizational, and worldview

Standard 2

Cover the following acts that were created to ensure equal employment opportunity

- ADA
- ADEA
- Equal Pay Act

Performance Skill

- Find a business or organization that has a mission statement or vision statement that encourages diversity in their organization. OR
- Write a diversity and inclusion statement for a specific organization

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		

STRANDS AND STANDARDS
BUSINESS LEADERSHIP 2

Learning that works for Utah
CTE®

Course Description

This class teaches how to be an effective leader. Concepts include creating a positive culture, building effective teams, leadership employability skills, consensus building and change management, resolving conflict, change management, and creative problem solving. Students will be asked to participate in teams as both a team ember and as a leader to practice the skills they will learn through this course.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	37.01.00.00.155
Concurrent Enrollment Core Code	N/A
Prerequisite	Business Leadership 1
Skill Certification Test Number	419
Skill Certification Cut Score	**73%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Business, Finance & Marketing (CTE/General)
Endorsement 2	Business, Finance & Marketing Essentials
Endorsement 3	N/A

Updated: July 2024

Strand 1

Leadership Employability Skills

Students will develop the leadership skills needed for employment in any given career field.

Standard 1

Leadership Purpose

- Why: the individual reason that someone seeks leadership
  - Understand the reasons an individual would seek a promotion or ask to be responsible for others.
- As a Success Measurement:
  - Tangible results like profits, ROI, and expanding into new markets
  - Employee morale and retention
  - Team productivity and innovation
  - Influencing others (More than followers on a platform)
  - Customer satisfaction

Standard 2

Communication Skills

Students will explore business communication methods and the appropriate application of those methods.

- Verbal: Tone, word choice, sarcasm use. Discuss both in person, over the phone, and during digital or virtual calls.
  - Unavoidable: We are communicating even when we are not choosing to verbally speak. Body language and facial expressions communicate volumes.
  - Continuous: Don't make assumptions when communicating. One-way communication is still communicating. Even if the receiver is not paying attention. Assuming understanding creates communication breakdowns.
    - Create processes, policies, and timelines to ensure understanding.
  - Learned: Understanding the contextual environment of your organization and the employees helps to create better communication.
- Written: Determine the type of writing that is the most appropriate for the setting and audience.

Example:

  - Emailing clients with invoices vs texting them an amount
  - Texting a coworker to cover a shift
  - Calling in sick or informing your supervisor that you'll be late
  - Follow-ups and progress reports through text or email
- Presentations: Use appropriate visual aids designed to focus and draw attention. Layouts should be simple and easy to follow, adding to the presentation.
  - Don't read from the screen, use presenter mode, and practice before presenting
  - Write a script and use the notes section to plan out the presentation content
  - Create interaction throughout the presentation
  - Know your audience. Don't use acronyms and analogies that don't relate to the audience. Capture their attention and create credibility.
  - Eye contact with the audience is essential
- Conducting a meeting:
  - Define the purpose of the meeting
  - Set meeting norms
  - Keep the meeting flowing
  - Set and use the agenda to stay on subject
  - Engage all the team members
  - Begin and end on time

    - Invite the right people
    - Send a follow-up summary and reminder of task and meeting content.
- Decide the most appropriate format for all stakeholders
    - Virtual Meetings
    - In-Person

Standard 3

Making informed decisions

- Data-driven decision making (DDDM) is defined as using facts, metrics, and data to guide strategic business decisions that align with your goals, objectives, and initiatives.
    - Removes biases and provides evidence for making tough decisions
- Feedback from your team:
    - When feedback is regularly used to make decisions, engagement rises, productivity increases, and organizations become more closely aligned with the values
- Review AI challenges: when using AI for decision-making. Include the pros and cons of AI use in making decisions
    - Review the sources from the search results
- Determine policies for the ethical use of AI in Business.
    - Should you disclose when you are using it and what data you provided to AI?

Standard 4

Accountability

- Scheduled performance reviews: Annual performance reviews that are held consistently can provide an opportunity to discuss the performance of the employee and to receive informal feedback on the direction of your leadership.
- ROWE: Results Only Work Environment. This work environment is all about accountability. Instead of requiring time from employees to earn their pay, it looks at the productivity and the actual outcomes that an employee's efforts provide toward the business's goals.
- Constructive Criticism: Corrective feedback that is given in a positive way to help employees to improve their performance.
- Positive Feedback: Encourages continuing a given behavior and action. Be specific, be positive, and be sincere.
- Anonymous Surveys: given from employees to leaders can help to provide feedback on the direction of the business and the leader. The anonymity allows for a safe place to be completely honest about how they feel with no repercussions
- Peer-to-peer feedback: Oftentimes, a team must interact or take work from another team. The need for good collaborative relationships in this process is essential. Peer-to-peer feedback provides a horizontal vs a vertical alignment in values and goals.

Performance Skill

Students will utilize one of the above feedback strategies for a class, CTSO, or club project. As the leader, they can gain feedback from their employees to improve the project in the future. Students will describe the feedback they chose and some of the responses they received.

Strand 2

Creating a Positive Culture

Students will understand and implement strategies that create a positive culture.

Standard 1

Make a Plan

Create an environment that draws talent to the organization

- Create a clear map: Provide a detailed description of the destination or company vision.
- Have a shared progress report: A goal that all are working to achieve and is in alignment with the company's goals.
- Keep repeating the plan: promote the staff to internalize or own the plan by repeating it frequently.

Standard 2

Create Culture

Describe the basic steps for creating an organization's culture.

1. Create your cultural values
2. Commit to sticking to your values
3. Have Credibility, be accountable for your commitment to build and create the culture

Standard 3

Have Crucial Conversations

Explore the ways a crucial conversation between two or more people can affect culture. Crucial conversions occur when stakes are high, opinions differ, and emotions run strong. These conversations are also difficult because the decisions made have the potential for negative consequences and impact.

Performance Skill

Students will research the culture of an organization by reading and listening to current media and present their findings to the class.

Strand 3

Building effective teams

Students will explore the reasons teams are formed and the characteristics of effective teams. Discuss team norms and behaviors and the importance of team-building activities.

Standard 1

Explain the “why” for forming the team you are building. Ensure that the goals of the team are aligned with the organization’s mission and vision.

Describe the traits of individual team members who need to accomplish the team’s goals.

- Leader: Provides vision and direction, inspiring and guiding the team toward common goals.
- Strategist: Analyzes situations, develops plans, and makes informed decisions to navigate challenges effectively.
- Executor: Focuses on task completion, ensuring that plans are implemented efficiently and objectives are met.
- Innovator: Generates creative ideas and challenges existing processes to drive improvement and foster innovation.
- Team Player: Promotes collaboration and maintains harmony within the team, facilitating effective communication and cooperation.

Standard 2

Discuss effective team norms and behaviors

- Set clear expectations
- Has united goals and purpose
- Has defined roles and responsibilities
- Treats everyone with respect and seeks input from all team members
- Prioritizes collaboration and cooperation
- Open to periodic adjustments and evaluations

Standard 3

Explore team-building exercises and why they are used.
Team building exercises: Activities, exercises, and strategies designed to foster trust, enhance teamwork, and align team members toward common goals.

Common Types of Team-Building Activities:

- Icebreaker games
- Problem-solving challenges
- Outdoor retreats
- Workshops and training sessions
- Role-playing exercises

Understand why organizations use team-building activities

- Improving Communication: Encouraging open and effective dialogue among team members.
- Building Trust: Establishing a supportive and reliable work environment.
- Enhancing Collaboration: Encouraging teamwork to achieve shared objectives.
- Boosting Morale & Motivation: Creating a positive and engaging team culture.
- Identifying Strengths & Weaknesses: Helping members understand their roles and how they contribute to the team.

Performance Skill

Have students design a team-building activity for a class or organization, including identifying the goals of the activity.

Strand 4

Strategies of Change Management
Students will understand that change is difficult in organizations, but there are strategies that can improve the process, such as consensus building and managing emotions.

Standard 1

Consensus Building: is a process of working toward agreement within a group by fostering collaboration, open communication, and mutual understanding.
Describe when consensus is needed in an organization

- Seeking support for a new initiative
- Implementing a significant change
- Addressing complex issues where perspectives are needed.

Explain how to building consensus works
Leaders encourage open dialogue, compromise, and mutual understanding to reach an agreement that everyone can support.

Standard 2

Managing Your Own Emotions
Students will understand and practice how to manage negative emotions like: frustration, worry, anger, dislike, and disappointment.
Strategies for Managing Emotions:

- Stop and Evaluate
- Compartmentalization
- Focus on building positive thoughts and actions
- Relaxation techniques
- Know your triggers
- Check your mindset
- Be respectful
- Adjust your goal

Standard 3

Students will understand the need for leadership to manage others' emotions.

F- Feed them. Get them to focus on their physical state through breathing exercises, taking a drink, or calling for a break.
I- (Show) Interest that is genuine. Ask them questions to disarm them if they are getting upset, and validate them and their perspective. Listen.
E- (get) Eye contact and say their name. Hearing their name snaps them out of a heightened emotional place and can be emotionally grounding.
L- Leave them never - even when they tell you to go away, examine the situation and know when space is needed and when further conversation is appropriate.
D- Down on their level is where you need you need to be. Relate to them, sit down and pull up a chair to be on the same level vs. talking from far away or over them.

Standard 4

Evaluating Policies and Procedure, the processes used to determine if an organization's current practices are in alignment with goals, missions, and vision.

- Policies are written protocols for how to handle various business functions. These rules determine how procedures are developed, carried out, and evaluated.
- Procedures are directions on how to implement policy.
- Update and Review: to ensure that the policies and procedures are current and relevant to the organization's vision and mission.

Performance Skill

Role play dealing with negative emotions in a work setting.

Strand 5

Creative Problem Solving

Students will understand the importance of creativity in the problem-solving process

Creative problem solving (CPS) is a way of solving problems or identifying opportunities when conventional thinking has failed.

Standard 1

Making space for creativity in a work environment.

- Downtime at work: The brain uses this downtime as fuel to incubate and innovate. Creative work environments incorporate downtime into their workflow.
- Play at work: It allows a person to discover why and how things are done within a certain framework, finding new and different solutions to problems.
- Passion projects at work: They help you build new skills or hone existing ones. You can use your creativity, imagination, and resourcefulness in new ways.

Standard 2

Define the creative problem-solving process

- Clarify: this phase explores a vision or desired outcome and the exact problem to be solved.
- Ideate: this phase focuses on idea creation.
- Develop Solutions: This phase turns promising ideas into more workable solutions.
- Implement: This phase that explores the acceptance of the idea and develops a more detailed implementation plan

Standard 3

Strategies for engagement and avoiding groupthink

Create a space where everyone has a voice using some classic strategies

- Socratic Questioning: a form of group discussion, based on asking and answering questions to stimulate critical thinking and to draw out ideas. This is a more formal style where the leader acts as a facilitator and withholds their own opinion.
- Think-Pair-Share: a strategy where employees first think through the problem on their own, then share with a partner, and then with the whole group to solve a problem.
- Brainstorming: an informal approach to problem-solving where all ideas are accepted.
- Take a Break: Set the problem aside, sleep on it, do some research, and reevaluate at a scheduled time.
- Circles: The Leader gives a prompt, no one can speak or react visibly in a negative or positive way, and each person is given a chance to express their opinions.

Performance Skill

Students will participate in the creative problem-solving process and then complete a self-reflection or review of the process.

Strand 6

Resolving Conflict

Students will understand the types and causes of conflict and how to use different strategies to resolve conflict in the workplace.

Standard 1

Understand the difference between functional and dysfunctional conflict and strategies to resolve conflict.

Types of Conflict

- Functional conflict is a healthy, constructive disagreement between groups or individuals
- Dysfunctional conflict is an unhealthy disagreement that occurs between groups or individuals

Temporary strategies

- Competing: to stress your position without considering opposing points of view.
- Accommodating: to forego your concerns in order to satisfy the concerns of others.
- Avoiding: to keep away from or stop oneself from doing or to stay away from someone or something, or being work avoidant simply means moving forward while ignoring key pieces of work that either do not interest you or are intimidating for some reason

Enduring strategies

- Collaborating: to satisfy both sides. It is highly assertive and highly cooperative; the goal is to find a "win/win" solution.
- Compromising. To give up something you want in order to reach an agreement
- Get Curious or seek to understand before being understood.
- Use the phrase "Tell me more."
- Ask open-ended questions of the participants
- Understanding the variance of personal narratives in conflict

Standard 2

Students will learn to lead with empathy, or the ability to understand and share the feelings of another person.

- Perspective taking: to see the world as other people see it.
- Be Non-Judgmental: try to set aside any preconceived ideas of the individual before having interactions and conversations.
- Understand feelings: learn not to avoid emotions when discussing conflict. Being emotionally intelligent is key to understanding others' perspectives.
- Communicate understanding: show emotional intelligence by being able to express understanding of the viewpoint.
- Mindfulness: taking a balanced approach when it comes to perspectives so we are not exaggerating or suppressing others' emotions.

Performance Skill

Students will investigate a workplace conflict by interviewing a trusted adult. Then return to the classroom and make suggestions on how the above strategies could have been used to resolve the conflict.

Skill Certification Test Points by Strand

Test Name	Test #	1	2	3	4	5	6	Total Points	Total Questions
Business Leadership 2	419	X	X	X	X	X	X	54	43

STRANDS AND STANDARDS

MARKETING 1

Course Description

Marketing 1 explores the seven core functions of marketing which include: Marketing Planning – why target market and industry affects businesses; Marketing-Information Management –why market research is important; Pricing – how prices maximize profit and affect the perceived value; Product/Service Management – why products live and die; Promotion – how to inform customers about products; Channel Management – how products reach the final user; and Selling – how to convince a customer that a product is the best choice. Students will utilize knowledge in hands-on projects which may include: Conducting research, creating a promotional plan, pitching a sales presentation, and introducing an idea for a new product/service.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	32.01.00.00.165
Concurrent Enrollment Core Code	32.01.00.13.165
Prerequisite	None
Skill Certification Test Number	401
Skill Certification Cut Score	**76%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Business & Marketing (CTE/General)
Endorsement 2	Business & Marketing Essentials
Endorsement 3	N/A

Updated: March 2025

STRAND 1

Principles of Marketing: Students will understand the principles of marketing including the seven core functions, the 4P's of the marketing mix and their practical application found in workplace settings and CTSOs.

Standard 1

Define **marketing** as added value, a way to connect a business' products and services to customers who want and need them and have the ability to buy. Then identify the seven core functions.

- Understand that marketing includes the following seven core functions:
  - **Market Planning** - identifying target market, determining appropriate marketing strategies, setting and measuring budget effectiveness
  - **Marketing Information Management** - gathering and analyzing information about: markets, customers, industry trends, competing businesses, and new technology
  - **Pricing** - using financial information to see prices that cover costs and allow for a profit, researching and analyzing pricing of competitors, and adjusting prices as needed
  - **Product Service Management** - Determining which products a business should offer to meet customer needs, possibly developing of a new product, and improving a current product such as Brands, Quantities, Colors, Sizes, Features
  - **Promotion** - Communicating with customers in an effort to influence behavior. All communication from an organization to a customer is considered promotion such as Personal selling,,Advertising, Sales promotion, and Public relations
  - **Product Channel Management** - a route a product takes from a product to a customer, on-time delivery, transferring product ownership, and where products are sold
  - **Selling** - All personal communication with customers such as Helping customers in a store, Making sales or product demonstrations, Providing any form of customer service

Standard 2

Understand the **marketing mix** or **4 P's of marketing**.

- Identify the four elements of the marketing mix
  - **Product** - possibly the most important, can be a good, and service.
  - **Price** - amount of money requested or exchanged for a product, should cover expenses and allow for a profit
  - **Place** - activities involved in getting a product or service to the end user, may include: shipping, ordering processing, inventory storage, and stocking of goods. Describe that place can be both a physical location or online site.
  - **Promotion** - process of communication with customers and potential customers to inform, persuade, and remind about products, their price, and where they can be purchased
  - Explain how each component of the marketing mix contributes to successful marketing.

Standard 3

Explore and find examples of marketing all around us, including marketing-related careers, CTSO's, case studies, guest speakers, and community partners

STRAND 2

Marketing Planning: Students will understand the concept of marketing planning; both the internal and external factors.

Standard 1

Define the following marketing terms

- **Marketing Plan** - a strategic roadmap that businesses use to organize and track their promotional and financial goals
- **Marketing Position** - refers to the consumer's perception of a product in relation to competing products and how it is different
- **Marketing Share** - the specific percentage of total industry sales of a product achieved by a single company in a given period of time
- **Niche Marketing** - promoting and selling a product or service to a specialized segment of a market
- **Mass Marketing** - production and distribution of a product that will appeal to the highest amount of people possible without regard to segmentation
- **Situational Analysis** (e.g. SWOT) - evaluating the internal and external factors of a business through market research to identify an organization's current strengths, weaknesses, opportunities, and threats.

Standard 2

Target marketing, focusing all marketing efforts on a very specific group of people through implementation of **Marketing Segmentation** which is the process of dividing a market of potential customers into specific groups based on different characteristics

- **Demographics**; Who? (Personal characteristics such as Age, Gender, Income Level, Education Level, Race, Ethnicity)
- **Geographics/Location**; Where? (Segmentation based on where people live such as Natural or Political Boundaries, Climate, Cultural influences, and Customs)
- **Psychographics/Interests**; Why? (Involves grouping people with similar lifestyles, as well as shared attitudes, values, and opinions such as Activities, Attitudes, Personality & Values)
- **Behavioral**; How? (Looking at the benefits desired by consumers such as shopping patterns, usage rate, benefits--and not just the physical characteristics of a product)

STRAND 3

Marketing Information Management: Students will understand the concept of marketing information management: as the need to gather and evaluate information for use in making business decisions.

Standard 1

Identify how marketing information from primary and secondary sources influences marketing decisions

- Define **Primary Research** as original research conducted to collect data specifically for a current objective. Examples may include conducting a survey, running an interview or a focus group, observing behavior, or doing an experiment. Primary research may utilize digital channels like emails, apps and in app purchasing. The researcher obtains this raw data directly and collects it specifically for current research needs.
- Define **Secondary Research** as purchased or contracted research that has been gathered by another company. This data may be purchased from any number of sources including companies such as Adobe, Qualtrics and Google, government agencies or even industry researchers and analysts.

Standard 2

Explore and discuss utilizing market information to make business decisions. Recognize that gathering data is only valuable when it is utilized for product improvement, finding new customers, and/or improving brand experience.

STRAND 4

Pricing: Students will understand the concept of pricing as the strategies used to determine customer perception of value for a product or service with the ultimate goal to maximize profit.

Standard 1

Understand how businesses make pricing decisions

- Identify goals for pricing: which include profit, market share and competition
- Identify diverse factors affecting price such as: perceived value, competitor pricing, convenience for customers, costs (distribution costs, employee costs) & expenses (determine profit margin)
- Explain the impact on price of the economic principles of:
  - **break-even point**--defined as the point when sales revenue (income) equals the cost (expenses) of making and distributing the product.
  - **supply and demand**--defined as the interaction between seller and the buyer. Generally, as price increases people are willing to supply more and demand less and vice versa when the price falls.

Standard 2

Discuss how businesses use **pricing strategies** to attract customers and create value. (Strategies may include: odd/even pricing, loss leaders, prestige pricing, penetration pricing, price bundling, price lining, or everyday low pricing.)

STRAND 5

Product Service Management: Students will understand the concept of Product Service Management: the strategies used to create, maintain, improve, and add to a product and service mix.

Standard 1

Explain the role of product/service management as a marketing function

- Define the concept of product mix including: **product lines**: A group of closely related product items, **product width/breadth**: the total number of product lines that a company offers to sell and **product depth**: is the number of versions of a product that a firm offers.
- Understand the importance of generating new products, services or ideas. Explore emerging products in the digital space including the following *Software as a Service (SaaS)* a way of delivering applications over the Internet—as a service.
- Understand that successful products need to fill a need and/or solve a problem.

Standard 2

Identify the components of the product life cycle (Development, Introduction, Growth, Maturity, Saturation, and Decline) Describe the different stages and common marketing strategies and goals used during each stage.

- **Introduction Stage**: is when a product is first launched in the marketplace. This is when the marketing team begins building product awareness and reaching out to potential customers. This stage is focused on advertising and marketing campaign implementation.
- **Growth Stage**: consumers have accepted the product in the market. That means demand and profits are growing. Competition begins and the marketing team seeks to establish a brand presence so consumers choose them over their competitors. Companies start thinking about new distribution

channels, product features and other support services.

- **Maturity Stage**: is when the sales begin to level off from the fast growth of the introduction period. Companies begin to reduce their prices so they can stay competitive amongst growing competition. They now focus on becoming more efficient and their marketing campaigns focus on differentiating themselves from competitors.
- **Decline Stage**: during this stage sales decline and consumers lose interest in the product. Companies determine that this product has run its course and is ready to be discontinued. As a last attempt companies may change product packaging to try and revive it.

STRAND 6

Promotion: Students will be able to explain the concept of Promotion.

Standard 1

Explain the role of promotion as a marketing function.

- **Define promotion**: the strategies used to build awareness of a brand and its product.
- Identify elements of the **promotional mix** including:
  - **Advertising**: the act or practice of calling public attention to one's product or service.
  - **Public Relations**: is a strategic communication process that builds mutually beneficial relationships for a company and the public or its markets.
  - **Selling**: is a process of persuasion to get potential customers to take action.
  - **Sales Promotion**: marketing technologies aimed to increase the demand in particular products and increase brand awareness
- Define **branding** as a company name, logo, the design, or a combination used to identify and differentiate itself from the competition. Branding should connect with customers emotionally and motivate them to buy.
- Explain the importance of creating a **brand experience**: the essence of what you represent, a company's positioning, and the experience you are trying to deliver at each interaction with your customers.

Standard 2

Understand promotional channels used to communicate with the target market.

- Give examples of **advertising media**: the means that marketers choose to use to communicate with their target audiences including:
  - **Print media**: billboards, wrapped vehicles, LED tools, newspaper, magazine, direct mailers any medium that is physically printed out.
  - **Digital Media**: pay per click, e-mail, in apps, social media, texting, and push notifications
  - **Broadcast and streaming**: TV, radio, YouTube, Spotify, Netflix, Amazon, Hulu
- Identify public-relations activities including a **press release**: is a written communication that reports specific but brief information about an event, circumstance, product launch, or other happening and **publicity**: is any promotional communication regarding a company or its products where the message is not paid for by the organization often benefiting from it.
- Determining a customers preferred communication styles and preferences (email, chat, phone, telephony, or in-person)
- Discuss examples of sales promotions which include: subscriptions, coupons, loyalty programs, samples, premiums, sponsorship, and product placement.

STRAND 7

Product Channel Management: Students will understand the concept of Product Channel Management as the strategies to distribute products to consumers.

Standard 1

Identify methods of product channel management.

- Define a **channel of distribution** as the network used to get a product from the manufacturer/ creator to the consumer (B2C) or industrial user (B2B). This may include agents, wholesalers, retailers, distributors, online retailers or end users through direct and indirect channels.
- Recognize the impact of inventory and delivery systems (e.g. Just-In-Time, automated inventory, same day, next day, and two-day)

Standard 2

Identify the methods of transportation for products including: trucks, air, ship, and rail.

- Describe the importance of international distribution channels. Disruptions in one area (Suez canal, Panama canal, Strait of Gibraltar) can have ripple effects throughout many markets.

STRAND 8

Selling: Students will understand the concept of Selling as the strategies and process to convince a potential customer to purchase a product or service and to remain a loyal customer.

Standard 1

Explain the role of **selling as a marketing function**

- Explain the role of relationship building as a component of selling.
- Explain the importance of preparing for the sale by applying product knowledge of features and benefits.
- Research tactics to identify valuable information about potential prospects, determining decision maker contacts and overcoming common objections.
- Understanding that **conversion rate**, is the percentage of users that take the desired action, is a main metric used in sales.

Standard 2

Explain the steps of the **selling process** including:

- Identify potential customers
- Approach and engage the customer
- Determine customer needs by asking helpful questions
- Present the product (both features and benefits)
- Overcome the customer's objections by going back through the benefits to the customer
- Close the sale by converting the potential customer into a customer sales
- Suggestion selling: a sales technique where an employee asks a customer if they would like to include an additional purchase that might suit the customer.
- Follow up (sales pipeline management, endless-chain method, asking for referrals from satisfied customers)

Standard 3

Sales enablement is the activities, systems, processes, and information that support and promote knowledge-based sales interactions with clients and prospects.

1. Define common sales enablement tools and how they promote smart business practices
   - CRMs (Customer Relationship Management)

- Outreach tools
- Telephony systems
- Social media automation services

Performance Skills - choose 4 of the 6 marketing performance indicators

(note: using DECA or FBLA events as a resource to fulfill objectives is encouraged)

1. Students will be able demonstrate communication, problem solving, teamwork, and critical thinking skills as they work towards finding solutions to a case study.
2. Conduct primary and/or secondary research and analyze results for a real-life marketing problem with a community partner.
3. Create a digital marketing advertisement that promotes a product and incorporates one of the above pricing strategies.
4. Create a promotional plan for a company or product/service that considers the 4 P's and identifies the target market.
5. Students will be able to research career opportunities within the seven functions of marketing and demonstrate the skills necessary for success in the industry including: accountability, communication, dependability, teamwork, critical thinking, and problem solving.
6. Deliver a sales pitch that attempts to persuade someone (using at least 6 of the steps of the selling process) to close a sale of a product or service. *You can use a DECA or FBLA Sales Presentation or create your own product or service.

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points and Percentage Points by Strand								Total Points	Total Questions
Marketing 1	401	1	2	3	4	5	6	7	8		44
		5	7	3	4	6	6	5	5		
		11%	16%	7%	9%	14%	14%	11%	11%		

STRANDS AND STANDARDS
RETAILING

Course Description

This course will prepare the student to operate businesses that sell goods and services in both brick-and-mortar stores and through e-commerce. This course will provide insight into operations management, buying and merchandising, customer experience, sales and promotion, and employability skills. Students taking marketing-related courses should have the opportunity to participate in a related CTSO organization.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	32.01.00.00.240
Concurrent Enrollment Core Code	32.01.00.13.240
Prerequisite	None
Skill Certification Test Number	407
Skill Certification Cut Score	**75%**
Test Weight	0.5
License Area of Concentration	Secondary Education 6-12
Required Endorsement(s)	
Previous Endorsement(s)	Business & Marketing (CTE/General), Business & Marketing Essentials
Current Endorsement(s)	BFM Marketing and H&T, BFM Business Administration

STRAND 1

Employability Skills

Students will explore career options and employability skills needed for gaining and maintaining employment in retail and e-commerce.

Standard 1

Explore career paths and opportunities associated with the retail industry

- **Cashier**: The person who handles customer transactions, processes payments, and gives change at the checkout.
- **Store Manager**: The person responsible for overseeing daily operations in the store, managing employees, and ensuring customer satisfaction.
- **Buyer**: The person who selects and purchases products for the store, making decisions about inventory and ensuring it meets customer demand
- **Sales Management**: The team or individual responsible for leading and motivating the sales staff to achieve sales goals and provide excellent customer service.
- **Marketing Management**: The team or individual responsible for promoting the store's products and services, planning marketing campaigns, and increasing customer awareness.
- **Visual Merchandiser** (both in-store and online): The person who arranges and displays products in a store or online platform to attract customers and encourage sales.

Standard 2

Learn and describe how to apply durable skills for retail employees and management

- Adaptability: the ability to adjust quickly and effectively to changing situations, tasks, or customer needs.
- Collaboration: the ability to work effectively with coworkers, supervisors, and other vendors to maintain smooth store operations.
- Communication: the ability to clearly and concisely exchange information with customers, coworkers, and supervisors through verbal, non-verbal, and written means.
- Engagement: the ability to enthusiastically provide customer service, take the initiative, contribute to team goals, and show pride in your work.
- Innovation: the ability and willingness to introduce new ideas, approaches, or improvements that enhance customer experience, store operations, or increase sales.
- Leadership: the ability to positively influence and guide others to achieve shared goals, deliver excellent customer service, and maintain a positive work environment.
- Professionalism: the ability to maintain a positive attitude, follow policies, be courteous, dress appropriately, and handle challenges calmly.

Standard 3

Demonstrate an understanding of the role of the retail manager for recruiting, hiring, training, supervising, and terminating employees, as well as maintaining the everyday operation of a business to ensure that it functions efficiently and meets established goals

- Explain how store managers recruit, select, motivate, train, and evaluate their employees.
  - Recruiting: the process of finding and hiring the right job candidates for the retail sector
  - Hiring process: creating job descriptions, reviewing resumes, conducting interviews, and selecting candidates for hire.
  - **Onboarding**: the action or process of integrating a new employee into a business or familiarizing a new customer or client with one's products or services.
  - Employee training: new employees is the formal or informal goal to quickly and efficiently prepare a

new employee to perform their job well
- Employee retention: a business's concerted efforts to retain their existing staff. Relate the elements of a positive working environment and motivational techniques to minimize employee turnover.
  - Employee incentive program: structured use of rewards and recognition to motivate desired behavior from employees
- Employee performance evaluation: a tool used by managers and human resource departments to review an employee's performance during a set period of time.
- Employee productivity: the amount of work (or output) produced by an employee in a specific period of time.

Standard 4

Understand the measures used in securing a retail business.

- Explain the importance of security policies and safety precautions for a retail business.

Describe internal and external theft in a retail business.

Internal theft, also known as employee theft, consists of any stealing or taking of business property without permission.

- **Shrinkage: the loss of inventory, leading to a discrepancy between the recorded inventory and the actual stock on hand.**
- **Sweethearting: is a form of employee theft in retail, where an employee gives unauthorized discounts, free merchandise, or other benefits to friends, family, or other individuals they know**
- **External theft: often called shoplifting, break-ins, robberies, or other acts by**
- **persons with no connection to the business.**

- Discuss methods of loss prevention as actions taken to reduce the amount of theft, breakage, or wastage in a business. This includes poor record-keeping and inventory management.
- Describe how to keep proper documentation, practice job rotation, and involve employees in the decision-making process.
  - Job rotation: the practice of moving employees between different tasks to promote experience and variety
  - Termination of employment: the end of an employee's work with a business.
  - Voluntary: when a worker leaves of their own accord
  - Involuntary: a business downsize or layoff, or if an employee is fired.

Performance Skills

Students will create an onboarding presentation that introduces new employees to a retail business. The project could include:

- A welcome packet with job descriptions and a company overview
- A training outline for at least one retail position
- A performance evaluation form and an incentive plan
- A loss prevention and safety guide (covering theft and security policies)
- A summary of the hiring process, including a sample job posting and onboarding checklist

STRAND 2

Customer Experience

Students will understand the importance of customer relations or the ways that a retailer will engage with its customers to improve the customer experience

Standard 1

Students will understand and examine merchandise planning in retailing

- **Visual merchandising**: the practice in the retail industry of optimizing the presentation of products and services to better highlight their features and benefits.
  - The purpose of visual merchandising is to attract, engage, and motivate the customer to make a purchase.
- **Store image**: the image or impression of a store in the minds of customers.
  - The goal of retailing is a good overall impression in terms of the products available in the store, the store itself, and the experience they expect when shopping at the store. Understand that store image also relates to online content, images, layout, and the total e-commerce experience.

Standard 2

Students will understand the essential need for good customer service

Customer service: the direct one-on-one interaction between a consumer making a purchase and a representative of the business that is selling it.

- This interaction is a critical factor in ensuring buyer satisfaction and encouraging repeat business. Employees play a critical role in meeting customer needs and expectations.

Stages of Effective Customer Service

- Opening: greeting by acknowledging the customer quickly with a friendly demeanor
- Discovery: questioning through active listening
- Resolution: through clarifying, paraphrasing, and summarizing
- Ownership: employee empowerment by clearly defining what the employee is allowed and limited to do in resolving issues.

Net promoter score: a calculation that measures the likelihood of a customer recommending your business. % of promoters - % of detractors

Ratings and Reviews: a written or online opinion or evaluation shared by a customer after using a product or service.

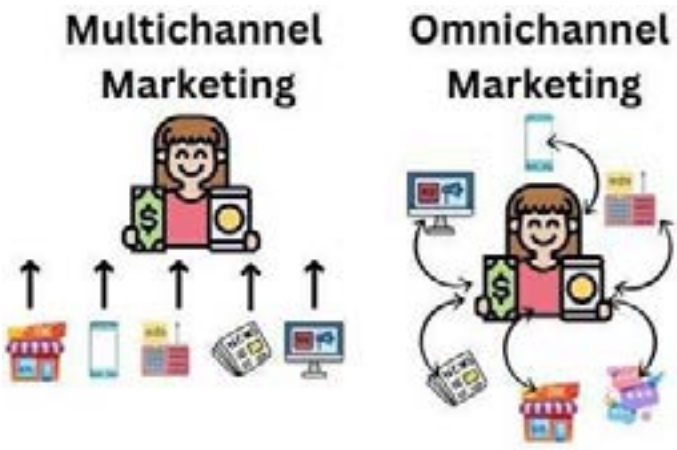
- Word of mouth: when a consumer's interest in a business, product, or service is directly reflected in their daily dialogues. It is essentially free advertising triggered by customer experiences. It can include something as informal as conversations and as formal as online reviews.
- Customer satisfaction ratings: known as customer satisfaction score, indicate how well products and services meet expectations.
  - This is usually determined by taking the number of happy ratings and dividing it by the /number of total ratings.
- Social Media: Businesses use social media to connect with customers, promote products, and get feedback. Customers can post
  - **Unsolicited review**: consumers sharing experiences, which can influence others to buy or not buy a product or service not contracted by the business.
  - **Earned review**: based on their satisfaction with the product or service, an individual chooses to promote a product or service.
  - **Unaffiliated review**: a review not sponsored by the business and helps others decide if they

want to try the business or product.
- **Affiliated review**: a review that is sponsored through a formal contract to review a product or service.

Performance Skill
- Evaluate in person the customer service experience at a school store or a retail store.
- Research and evaluate a product or retail store's customer satisfaction ratings, net promoter score, and reviews.

STRAND 3
Operations Management Students will understand the importance of planning, controlling, and securing both a retail and e-commerce business.

Standard 1
Students will understand the planning process for a retail business. Planning a retail business begins with making essential decisions for the business.
- Determine the primary operation of the business
  - Food operations: product assortment includes food or beverage items that account for the largest percentage of items sold
  - Retail operations: non-food items or services account for the largest percentage of gross sales
- Identify and define the types of store locations.
  - **Freestanding**: any stand-alone building
  - **Brick-and-mortar**: a business that operates conventionally rather than over the internet
  - **Unplanned business district**: when two or more stores are close together
  - **Centrally planned business district**: a centrally located area within a city for general retail shopping, personal and professional services, educational institutions, entertainment establishments, restaurants, and other business
  - **Pop-up**: retail business opened temporarily to take advantage of a faddish trend or seasonal demand
  - **Kiosk stores**: a small, temporary, stand-alone booth used in high-traffic areas such as in malls
  - **E-commerce sites**: Internet commerce refers to the buying and selling of goods or services using the internet, and the transfer of money and data to execute these transactions
    - Explain how consumers can be assured of an e-commerce site's security.



- Explain the location-selection criteria for physical stores
  - **Zoning**: laws define how structures can be built on a property and how those structures can be used
  - **Visibility**: the overall presence of a brand or its products in the general consumer environment
  - Storefront: the part of a store that faces the street, usually a glass front
  - **Traffic**: the number of customers that enter a store location or website.
- Explain essential decisions for an e-commerce store's;
  - **Social Commerce/In-app purchase**: the entire shopping experience from product discovery and research to the check-out process takes place right on a social media platform.
  - **Call to action**: the buttons throughout a site that tell your customers what to do, where to click, and what to buy
  - **Mobile friendliness**: includes multiple elements, design, navigation, layout, site speed, and general user experience. Consumers expect an intuitive experience
  - Updated and accurate inventory: the correct sizes, prices, and quantities available
  - **Consistent branding tone and design elements**: the online site should reflect the customer experience in a physical store and deliver on the unique value proposition of the brand
- Describe **multichannel retailing** as the practice of making products available to consumers on more than one sales channel.
- **Omni-channel**: defined as an approach to sales that focuses on providing a seamless customer experience whether the client is shopping online from a mobile device, a laptop, or in a brick-and-mortar store.
  - Omnichannel connects all channels, and means customers have a seamless experience across all channels.
- **Touchpoints**: where customers and businesses engage to exchange information, provide service, or handle transactions. It is your brand's point of customer contact, from start to finish. For example, customers may find your business online or in an ad, see ratings and reviews, visit your website, shop at your retail store, or contact your customer service.
- Introduce common **KPIs (Key Performance Indicators)**
  - SEO (Search Engine Optimization)
  - SERP (Search Engine Results Page)
  - Cart Abandonment Rate

Standard 2

Describe the importance of internal controls for a retail business.

- Explain how retailers evaluate their performance through financial goals such as;
  - **UPT**: Unit Per Transaction; a sales metric used to measure the average number of items that customers purchase in any given transaction. The higher the UPT, the more items customers are purchasing for every visit.
  - **DPT**: Dollar Per Transaction; a sales metric used to measure the average number of items that customers purchase in any given transaction. The higher the **DPT**, the more items customers are purchasing for every visit.
  - Compare daily sales against last year's sales: Today's Sales - Last Year's Sales = Amount over or under compared to last year
- Cash handling policies and procedures: checks and balances for employees and management to ensure that standards are kept throughout the business. Explain the use of the following financial statements;
  - **POS**: Point Of Sale; a software system where a customer executes the payment.
  - **Digital Payments**: the transfer of value from one payment account to another through electronic means.

- **Balance sheet**: a financial statement that reports a business's assets, liabilities, and shareholders' equity at a specific point in time, and provides a basis for computing rates of return and evaluating its capital structure.
- **Income statement**: also known as the profit and loss statement or the statement of revenue and expense, the income statement primarily focuses on the business's revenues and expenses during a particular period.
- **Cash flow statement**: a financial statement that summarizes the amount of cash and cash equivalents entering and leaving a business. It measures how well a business generates cash to pay its debt obligations and fund its operating expenses.

Performance Skill

Using UPT, DPT, and daily sales data to predict inventory and labor needs

- **Inventory needs**: Predict which products will likely be in high demand, and estimate the quantity of **each product that should be stocked.**
- **Labor needs**: Determine when peak sales periods are likely to occur and estimate the number of staff members needed to effectively handle customer traffic and transactions during those times.

STRAND 4

Buying and Merchandising

Students will understand the role and responsibilities of a retail buyer and apply key concepts of buying and merchandising to a retail business.

Standard 1

Understand and define the responsibilities and roles of a retail buyer.

- **Retail buyer**: the person responsible for planning, selecting, and purchasing quantities of goods and merchandise that are sold in retail stores. They source and review existing goods to ensure their products remain competitive.
- Examine and discuss the key components of strategic planning and buying in retail.

  Supply: higher prices boost the supply of an economic good while lower ones tend to diminish it.
  Demand: the demand level for a product or a resource will decline as the price rises and rise as the price drops.
  Inventory control: the process of ensuring that appropriate amounts of stock are maintained by a business, to be able to meet customer demand without delay while keeping the costs associated with holding stock to a minimum.
  Forecasting: attempts to determine the supply of and demand for various products and services.
  Lead time: the amount of time between recognition that an order needs to be placed and the point at which the merchandise arrives at the store.
  Stock turnover: the number of times inventory is sold or used in a certain time period.
  Perishability: how long something can be stored before it begins to "go bad" (Expired, become ruined, become obsolete)
  Supply chain management: the process of ensuring that the product arrives at the business in a timely manner. This includes aspects such as planning, sourcing, manufacturing, delivery, and logistics, and returning products deemed defective, in excess, or unwanted.

Standard 2

Analyze and apply the five components of a Merchandise Plan.

- **Merchandise Plan**: a systematic approach to planning, buying, and selling merchandise to maximize your return on investment while simultaneously making merchandise available at the places, times, prices, and quantities that the market demands.
- Describe the components of a merchandise plan. Explain how merchandise plans work in the retail industry.
  1. Product: anything and everything that a business decides to offer as a good or service.
  2. Price: the amount of money requested or exchanged for a product should cover expenses and allow for a profit
     - **Perceived value**: a customer's own perception of a product or service's merit or worth
     - **Overhead**: the general, fixed cost of running a business, as rent, lighting, and heating expenses, which cannot be charged or attributed to a specific product or part of the work operation.
     - **Cost per unit**: the combination of all expenses/costs to produce a single unit.
     - **Profit**: money from revenue after all expenses are taken into account.
     - **Markup**: the amount added to the cost price of goods to cover overhead and profit.
     - **Markdown**: discounting a product in order to try to recoup purchasing costs.
     - **Break-even point**: defined as the point when sales revenue (income) equals the cost (expenses) of making and distributing the product.
     - **ROI**: Return on Investment; the measure of profitability of a retail item.
  3. **Range**: refers to the width/breadth and depth of products offered for sale in a retail establishment.
     - Product items: a specific version of a product that can be designated as a distinct offering among a business's products.
     - Product lines: a group of closely related product items
     - Product width/breadth: number of different product lines carried by the business
     - Product depth: the total number of variations for each product. Variations can include size, flavor, and any other distinguishing characteristic.
  4. Assortment: how many brands you offer within the same product Example: If your establishment decides to carry spearmint gum, how many brands will you carry? Five, Extra, Trident, Bubblicious.
  5. Space: the most limiting part of a merchandise plan. You need to know where to put it in order to present the product to the customer in a visually appealing and effective manner to encourage additional purchases. There is only so much physical space in a retail store and page space on an e-commerce site before it becomes cluttered.

     Store layout: the design of a store's floor space and the placement of items within that store to optimize and encourage additional sales.
     - Analyze the use of visual merchandising in retailing (brick-and-mortar and online)

     Planogram: a diagram that shows how and where specific retail products should be placed on retail shelves or displays in order to increase customer purchases.

     Page layout: the arrangement or organization of visual elements on a web page.

     Above the fold: The space visible on a mobile/website without scrolling.

Standard 3

Analyze components of vendors and vendor negotiation.

- Define vendors as a general term used to describe any supplier of goods or services who intends to sell them to another business.
- Discuss examples of vendors used in retail and why vendors are used.
- Analyze and identify parts of a purchase order and how they apply to a retail business.
  - **Purchase order**: an official document issued by a buyer to a seller indicating types, quantities, and agreed prices for products or services they wish to buy.

- **Shipping terms**: an agreement between buyer and seller on how the product will be shipped, who is responsible for payment, and when ownership is transferred.
- Understand elements associated with accounts payable and early payment discounts.
  - Define **accounts payable** as money owed by a business to its creditors.
  - Calculate common discounts given for early payment, such as 2/10 - n/30, and explain what these terms would mean. (2% discount given if paid in 10 days, net must be paid in 30 days.)

Standard 4

Explain key components of the receiving process and stock handling.

- Receiving process: the process of matching items shipped against items ordered on a purchase order.
- Discuss what happens when the product shipped to you does not match the purchase order, or if the product shipped is damaged.
- Discuss inventory counts and how numbers being off could affect the ability to fulfill customer orders.
  - **Perpetual inventory**: an inventory determined by keeping a continuous record of increases, decreases, and the balance on hand of each item of merchandise. Usually kept through a point of sales system.
  - **Physical inventory**: A periodic inventory is conducted by counting, weighing, or measuring items of merchandise on hand.

Performance Skill

Evaluate new product ideas for a store and determine appropriate pricing strategies for them. Calculate ROI, Break-Even Point, and markup for a product.

STRAND 5

Sales and Promotions

Students will understand the importance of sales and promotions in retail businesses and design sales and promotion strategies for a retail business.

Standard 1

Plan selling strategies for a retail business

- Determine customer needs.
  - Know that retailers group customers into market segments to make approachable subset groups based on different characteristics like geographic, demographic, psychographic, and behavioral.
- Explain the importance of customer traffic for a retail business to turn visitors into customers.
  - **Retail conversion rate**: the percentage of visitors to a retail business who make a purchase (this applies to online and in-person).
- Demonstrate suggestion selling.
  - Suggestion-selling: a sales technique where an employee asks a customer if they would like to include an additional purchase that might suit the customer.
- Explain the process for documenting sales and how the tracking of sales impacts the retail business.

Standard 2

Demonstrate promotional activities for a retail business Understand promotional strategy. (Refer to Marketing 1 Strands & Standards)

- **Promotional mix:** an integration of selling, sales promotion, public relations, and advertising.
- Selling: a process of persuasion to get potential customers to take action.
- **Sales promotion**: a marketing strategy where the product is promoted using short-term attractive

initiatives such as discounts, free shipping, flash sale, product giveaways, price match, loyalty points, BOGO (buy one, get one free), holiday promotions.

- **Advertising media**: used for communicating a promotional message. Examples include online banners, radio spots, social media, billboards, television advertisements, print media, in-game advertising, and many more.
- Understand that there are pros and cons of each advertising medium based on the business and marketing strategy.
- **Cross-merchandising**: marketing or displaying products from different categories together, to generate additional revenue.

Performance Skill

Students will create a promotional campaign for a retail business. They will incorporate promotional mix items and create them for a specific market segment

Skill Certification Test by Strand Percentages

Test #407 Retailing	Strand 1	Strand 2	Strand 3	Strand 4	Strand 5	Total Test Questions
Test Questions	10%	15%	29%	28%	19%	45

Construction

Construction & Structural Systems		
Course Code	**Course**	**Changes**
40080000035	Construction Trades Foundations	Updated strands and standards to be more project based and to give students hands-on experience for electrical, plumbing, and carpentry to guide into the next courses within the pathway.
40080000401	Construction Management 1	Name change to "Residential Construction 1" as it is more descriptive of what students are actually learning in the course. Merging Carpentry 1 and Construction Management 1 as course contents were duplicative. Standards are introductory to the beginning stages of residential builds.
40080000402	Construction Management 2	Name change to "Residential Construction 2" as it is more descriptive of what students are actually learning in the course and builds upon Residential Construction 1. Merging Carpentry 2 and Construction Management 2 as course contents were duplicative. Standards are finishing stages of a residential build.
40080000403	Construction Management 3	Name change to "Construction Capstone" to better describe what students are actually learning in the course. This is designed to be a capstone for any construction educator to help students build upon their prior knowledge within the pathway whether they focused on electrical, plumbing, or general residential construction. This will guide students toward industry-related projects and management strategies to help guide students to enter into industry or a post-secondary program.

STRANDS AND STANDARDS
CONSTRUCTION TRADES FOUNDATION

Course Description
This course explores a variety of construction trades through practical, hands-on projects in HVAC, electrical, plumbing, and masonry, expanding their awareness of occupational opportunities in the world of construction. Students will learn essential skills and concepts in shop safety, tool usage, applied math, sustainability, pre-build processes, and building systems. Students will learn to identify and mitigate safety hazards, properly use and maintain construction tools, and perform accurate measurements related to construction projects.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	40.08.00.00.035
Concurrent Enrollment Core Code	40.08.00.13.035
Prerequisite	N/A
Skill Certification Test Number	510
Skill Certification Cut Score	**N/A**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Carpentry
Endorsement 2	Plumbing
Endorsement 3	Electrician
Endorsement 4	Construction Management

Updated: August 2025

STRAND 1: SHOP SAFETY

Students will learn and practice basic construction safety skills.

Standard 1

Identify potential safety hazards in a construction site or shop space.

- Power tools
- Hand tools
- Shop/Site Behavior
- Chemicals

Standard 2

Explain ways to mitigate safety concerns in a construction site or shop space.

- Training
- Procedures
- Cleanliness
- Personal Protective Equipment (PPE)

Performance Skills

- Perform a shop or site safety audit and report recommended solutions to potential hazards.
- Demonstrate safety practices and procedures based on regulations and requirements when working on a site or constructing a project.

STRAND 2: TOOLS & EQUIPMENT

Students will explore classifications of tools and their applications in construction.

Standard 1

Explain the uses of common construction tools and equipment.

- Hand tools
- Portable power tools
- Stationary tools
- Mobile equipment/machinery

Standard 2

List the proper care and maintenance procedures for common construction tools and equipment.

- Hand tools
- Portable power tools
- Stationary tools
- Mobile equipment/machinery

Standard 3

Discuss the types of power sources for tools and equipment.

- Corded
- Battery
- Pneumatic
- Hydraulic
- Combustion

Performance Skills

- Demonstrate safe and appropriate use of common construction tools and equipment when working on projects.
- Demonstrate proper care and maintenance of tools and equipment when working on projects.
- Pass relevant safety test(s) with 100% accuracy.

STRAND 3: CONSTRUCTION MATH

Students will use various construction measuring devices to accurately measure, calculate, and mark projects.

Standard 1

Demonstrate basic measurements in relation to construction.

- Square footage (flooring, sheetrock, etc.)
- Cubic yards (concrete, dirt, etc.)
- Conversions (feet, yards, inches, etc.)

Standard 2

Demonstrate use of measuring devices and methodologies.

- Traditional measuring tools (tape, optical transit, etc.)
- Electronic measuring tools (laser, GPS, etc.)
- Squaring tools (speed, framing, etc.)
- Leveling tools (bubble, laser, plumbob, etc.)

Performance Skills

- Accurately measure and mark within 1/16”.
- Accurately add, subtract, and divide measurements.
- Accurately convert between inches, feet, and yards.
- Accurately calculate volumes and areas.
- Accurately square a project using various methods.

STRAND 4: SUSTAINABILITY

Students will explore concepts, certifications, and practices for sustainable construction.

Standard 1

Recognize the permanence of construction and the built environment.

- Material processes
- Procedures
- Certifications

Standard 2

Recognize common sustainability certificates and discuss the benefits and drawbacks of each.

- Energy star
- LEED
- Other Certifications

Standard 3

Explore various sustainable energy sources.

- Solar (including passive and thermal mass)
- Wind
- Geothermal
- Hydroelectric
- Off-grid building (gray water, compost toilets, etc.)
- Building management systems / smart homes
- Engineered & recyclable building materials
- Natural gas

Standard 4

Explore various sustainable energy efficient building practices and the impact on the quality of human life.

- Framing
- Insulation types
- Passive solar
- R-values
- U-values

Standard 5

Discuss how sustainability regulations impact the cost of various building structures.

STRAND 5: PRE-BUILD PROCESSES

Students will explore the general structure of the construction process.

Standard 1

Compare between the various types of construction.

- New
- Existing
- Residential
- Commercial
- Heavy civil
- Industrial

Standard 2

Identify zoning and permits required for construction.

- City / county regulations (CCR, HOA, etc.)
- Codes and standards (IRC, NEC, UBC, IPC, etc.)

Standard 3

Recognize the needed infrastructure required for a build.

- Site planning (utility hookups)
- Surveying (offsets, boundaries, etc.)
- Building design / engineering

Standard 4

Identify common types of inspections (soils, foundation, framing, plumbing, electrical, etc.).

- Municipality differences

Standard 5

Discuss how regulations impact the cost of various building structures.

STRAND 6: BUILDING SYSTEMS & STRUCTURE

Students will understand the basic organization, function, and structure of a single family dwelling.

Standard 1

Illustrate the general organization of mechanical systems in a single family home.

- Plumbing (pipes, faucets, drains)
- Electrical (switches, outlets, breakers)
- HVAC (furnace, air conditioner, thermostat)

Standard 2

Explore blueprints and their uses in the construction of a single family home.

- Site plans
- Floor plans
- Elevations
- Sections
- Detail drawings
- Mechanical, electrical, and plumbing (MEP) drawings
- Structural

Standard 3

Identify the general structural components of a single family home.

- Foundation
- Floor (sill plates, floor joists, subfloor, sheathing, bracing)
- Walls (top/bottom plates, studs)
- Window/door framing
- Roof (rafters, trusses, sheathing)

Standard 4

Discuss the differences of building practices for single family homes.

- Wood frame
- Concrete masonry unit (CMU)
- Insulated concrete forms (ICF)
- Timber frame

Standard 5

Discuss the uses of common finishes.

- Interior (cabinetry, trim, textures, paints, flooring, tile, etc.)
- Exterior (roofing, siding, masonry, stucco, stonework, landscaping, etc.)

Performance Skills

- Construct a three-dimensional construction project (virtual or physical) from a two-dimensional design.

STRAND 7: CONSTRUCTION TRADE EXPLORATION

Students will explore various construction trades through basic hands-on projects and system maintenance activities.

Standard 1

Discuss the importance of regular inspections to maintain the function of a home.

Standard 2

Identify methods for documenting and tracking maintenance routines.

Standard 3

Discuss basic maintenance routines to help ensure efficient operation of an HVAC system.

- Change air filter
- Check thermostat settings
- Clean vents and registers

Standard 4

List safe procedures for working with electrical systems.

- Turn off power source (de-energize equipment, lockout/tagout)
- Use proper tools and equipment
- Wear PPE
- Avoid water and moisture
- Verify absence of voltage
- Maintain safe distances
- Follow proper wiring practices

Standard 5

Discuss basic maintenance routines to prevent plumbing issues.

- Fix leaks
- Keep drains cleared
- Water heater

Standard 6

Illustrate methods for maintaining masonry.

- Repairing cracks
- Replacing bricks
- Applying mortar

Standard 7

Identify methods for repairing a wall.

- Spackling
- Patching
- Painting

Performance Skills

Perform one or more of the following HVAC maintenance tasks:

- Change an air filter
- Perform basic maintenance cleaning

Perform one or more of the following electrical tasks:

- Remove and install a light fixture
- Remove and install an outlet
- Reset, open, and close of an electrical circuit breaker.
- Reset and test of GFCI receptacle

Perform one or more of the following plumbing tasks:

- Fix a leaky faucet.
- Remove and replace a plumbing fixture
- Clean or clear a clogged drain
- Winterize part of a plumbing system

Perform one or more of the following general maintenance tasks:

- Prep surfaces for painting
- Paint walls and trim (techniques)
- Repair a piece of furniture
- Install shelves or other hardware
- Patch/repair drywall

STRAND 8: CAREER PATHWAYS

Students will investigate career opportunities in the construction industry.

Standard 1

Explore occupations related to the construction industry.

- Subcontractors (framer, plumber, electrician, finish carpenter, tile setter, dry wall, roofer, etc.)
- Paver/Surfacer
- Heavy Equipment Operator
- Geotechnical Engineers
- Architect
- Interior designer
- Mechanical engineer
- Electrical engineer
- Structural engineer
- Civil engineer
- Landscape designer
- Surveyor
- Project manager
- Estimator
- Home inspector
- Consultants
- Realtors
- Loan originators
- Manufacturer
- Commercial driver
- Safety Manager

Standard 2

Describe different types of occupational training related to the construction industry..

- Apprenticeships (electrical, plumbing, carpentry, etc.)
- Manufacturer certification (glaziers, countertops, specialized light fixtures, etc.)
- Operator certification (forklift, crane, CDL, manlift, etc.)
- Safety certification (OSHA, Certified Safety Professional (CSP)
- Management Certifications (Certified Construction Manager (CCM), Certified Associate Constructor (CAC), etc.)
- Technical Certifications (LEED Professional Credentials, Certified Welding Inspector (CWI), etc.
- Specialized Certifications (Concrete Field Testing Technician, Stormwater Management Certification, etc.)
- University degree programs (architect, engineer, project management, etc.)

STRANDS AND STANDARDS
RESIDENTIAL CONSTRUCTION 1

Course Description

This course provides comprehensive training in essential construction skills, focusing on safety, tools, equipment, and foundational techniques. Participants will learn to identify and mitigate safety hazards, use and maintain construction tools, accurately measure and mark projects, interpret construction plans, prepare sites, work with concrete and foundations, frame wood structures, and install exterior finishes. The curriculum covers shop safety, tools and equipment, applied math, construction plans, site preparation, concrete, foundation, basic wood framing, and exterior finishes, equipping participants with the knowledge and skills necessary for safe and effective construction practices in various roles within the construction industry.

Intended Grade Level	9-12
Units of Credit	0.5-1.0
Core Code	40.08.00.00.401
Concurrent Enrollment Core Code	40.08.00.13.401
Prerequisite	Construction Trades Foundation
Skill Certification Test Number	512
Skill Certification Cut Score	**N/A**
Test Weight	N/A
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Carpentry
Endorsement 2	Construction Management
Endorsement 2	Residential Construction

Updated: August 2025

STRAND 1: SHOP SAFETY

Students will learn and practice basic construction safety skills.

Standard 1

Identify potential safety hazards in a construction site or shop space.

- Power tools
- Hand tools
- Shop/Site Behavior
- Chemicals

Standard 2

Explain ways to mitigate safety concerns in a construction site or shop space.

- Training
- Procedures
- Cleanliness
- Personal Protective Equipment (PPE)

Performance Skills

- Perform a shop or site safety audit and report recommended solutions to potential hazards.
- Demonstrate safety practices and procedures based on regulations and requirements when working on a site or constructing a project.

STRAND 2: TOOLS & EQUIPMENT

Students will explore classifications of tools and their applications in construction.

Standard 1

Explain the uses of common construction tools and equipment.

- Hand tools
- Portable power tools
- Stationary tools
- Mobile equipment/machinery

Standard 2

List the proper care and maintenance procedures for common construction tools and equipment.

- Hand tools
- Portable power tools
- Stationary tools
- Mobile equipment/machinery

Standard 3

Discuss the types of power sources for tools and equipment.

- Corded
- Battery
- Pneumatic
- Hydraulic
- Combustion
- Powder-Actuated

Performance Skills

- Demonstrate safe and appropriate use of common construction tools and equipment when working on projects.
- Demonstrate proper care and maintenance of tools and equipment when working on projects.
- Pass relevant safety test(s) with 100% accuracy.

STRAND 3: CONSTRUCTION MATH

Students will use various construction measuring devices to accurately measure, calculate, and mark projects.

Standard 1

Demonstrate basic measurements in relation to construction.

- Square footage (flooring, sheetrock, etc.)
- Cubic yards (concrete, dirt, etc.)
- Conversions (feet, yards, inches, etc.)

Standard 2

Demonstrate use of measuring devices and methodologies.

- Traditional measuring tools (tape, optical transit, etc.)
- Electronic measuring tools (laser, GPS, etc.)
- Squaring tools (speed, framing, etc.)
- Leveling tools (bubble, laser, plumbob, etc.)

Performance Skills

- Accurately measure and mark within 1/16”.
- Accurately add, subtract, and divide measurements.
- Accurately convert between inches, feet, and yards.
- Accurately calculate volumes and areas.
- Accurately square a project using various methods.
- Estimate the cost of materials for a given construction project.

STRAND 4: CONSTRUCTION PLANS

Students will explore construction drawings, specifications, and other construction documentation.

Standard 1

Compare various types of construction drawings, including their fundamental components and features.

Standard 2

Describe the purpose of basic construction drawing components.

Standard 3

Explain the importance of specifications.

Standard 4

Interpret items commonly shown on architectural and structural drawings.

Standard 5

Explain the importance of referencing mechanical, electrical, and plumbing plans.

Standard 6

Explain the significance of various drawing elements, such as lines of construction, symbols, and grid lines.

Performance Skills

- Read and interpret a construction drawing, specification, or other construction documentation.
- Build a given project to scale from a set of construction plans.

STRAND 5: SITE PREPARATION

Students will show the preliminary steps that must be taken on the site before construction can begin.

Standard 1

Classify the major types of soils.

Standard 2

Discuss how soil can affect design decisions.

Standard 3

Investigate ways to stabilize soils.

Standard 4

Explain the safe operation and use of construction equipment commonly found on a worksite.

- Aerial lifts
- Backhoes
- Compactors
- Compressors
- Forklifts
- Generators
- Skid-steer loaders

Standard 5

Discuss the safety precautions associated with construction equipment.

- Batteries
- Fueling
- Hydraulic systems
- Interlocking systems
- Transporting

Standard 6

Show the procedures for determining elevation and slope.

- Common instruments & tools

Performance Skills

- Use and properly care for tools and equipment associated with leveling.
- Read and interpret a set of construction plans for a job site.

STRAND 6: CONCRETE

Students will explore the methods and materials used in foundation and concrete work.

Standard 1

Explore various concrete ingredients and mixtures.

- Types (self-consolidating, fiber-reinforced, air-entrained, polymer, pervious, etc.)
- Characteristics
- Admixtures
- Aggregates

Standard 2

Investigate how various concrete mixtures are used in construction.

Standard 3

Describe proper curing methods.

Standard 4

Describe the methods and purposes for testing concrete.

- Sampling
- Slump test
- Compression test

Standard 5

Identify various concrete tools.

Performance Skills

- Calculate the proper concrete mix measurements and proportions for a given concrete project.

STRAND 7: FOUNDATION

Students will explore methods and procedures for foundation and concrete flatwork.

Standard 1

Compare traditional and monolithic foundations.

Standard 2

Identify the steps to perform an effective job-site layout.

- Building layout
- Building lines with batter boards
- Excavation and trenching
- Forms

Standard 3

Explain the proper methods for placing concrete into forms (pump, truck, concrete vibrator, etc.).

Standard 4

Identify various types of foundation forms and their proper removal (wood, manufactured, strip, etc.).

Standard 5

Describe how slabs-on-grade are formed and finished (screed, level, finish, cure, joint, seal, etc.).

Performance Skills

- Layout building lines with batter boards.
- Set stakes or string lines to a grade.

STRAND 8: BASIC RESIDENTIAL FRAMING

Students will explore basic framing techniques, practices, uses, and materials.

Standard 1

Discuss how various types of wood imperfections impact construction projects.

- Structural integrity
- Durability
- Aesthetics
- Safety
- Cost efficiency

Standard 2

Identify lumber markings and their meanings.

Standard 3

Identify the safety precautions associated with pressure-treated lumber.

Standard 4

Discuss the uses of various types of framing materials.

- Wood (dimensional lumber, pressure-treated)
- Engineered Wood (LVL, I-joists, laminated beams, etc.)
- Sheet Materials (OSB, plywood, tongue and groove, cement board, etc.)
- Metal

Standard 5

Describe the methods, tools, and processes for fastening components of a framed structure.

- Anchors (anchor bolts, expansion bolts, straps, ties, etc.)
- Fasteners (nails, schedule, staples, etc.)
- Subfloor Adhesive
- Sheer Walls

Standard 6

Label the structural components of a wood frame floor and their functions.

- Joists
- Subfloor
- Sill / bottom plate
- Bridging / blocking
- Beams

Standard 7

Label the structural components of a wood frame wall and their functions.

- Studs (king, trimmer/jack, cripple)
- Plates (bottom/sole, sill, double-top)
- Blocking
- Bracing
- Sheathing
- Corners

Standard 8
Describe the procedure for laying out a framed wall, including plates, corners, door and window openings, bracing, and firestops.

Standard 9
Label the structural components of a wood frame roof and their functions.

- Rafters
- Ridge board / beam
- Collar ties
- Ceiling joists
- Trusses
- Sheathing
- Bracing
- Blocking
- Venting
- Ledgers
- Fascia

Standard 10
Explore various roof shapes and structures (hip, gable, shed, dormer, flat, etc.).

Performance Skills
- Frame a basic wood structure from a set of drawings/specifications (floor, walls, and roof).

STRAND 9: EXTERIOR FINISHES

Students will explore common exterior finishes and related functional components.

Standard 1

Explore common exterior finishes.

- Wall (vinyl, brick, stucco, wood, fiber cement, stone, metal, composite, etc.)
- Roof (asphalt, metal, clay, concrete, slate, wood, synthetic, solar, green, rolled, built-up, etc.)

Standard 2

Illustrate the functional components of a roof.

- Square
- Coverage
- Exposure
- Rake
- Underlayment
- Flashing
- Weather guard
- Vents
- Gutters

Standard 3

Identify methods for the installation of common roofing materials.

Standard 4

Identify methods for the installation of common exterior wall finishes.

Standard 5

Compare various types of fixed, sliding, and swinging windows.

Standard 6

Illustrate the steps of a window installation.

Standard 7

Discuss the key differences of interior and exterior doors.

Standard 8

Discuss how geographic location and climate can impact the longevity and durability of exterior finishes.

Performance Skills

- Install a working roof component or finish a roof.
- Install an exterior wall finish.
- Install a prehung exterior door with weather-stripping.
- Install a lockset.
- Install a window.

STRAND 10: DURABLE SKILLS

These standards will not appear on state skill certification exams but should be taught throughout the duration of the course.

Standard 1

Students will display personal skills related to the essential values, personality traits, and personal characteristics for success in the construction profession and life.

- **Integrity** - demonstrate honesty and personal responsibility for actions.
- **Work ethic** - demonstrate tenacity, hard work, excellence, punctuality, meet deadlines; and be self-directed when completing tasks in the construction professional setting.
- **Professionalism** - demonstrate maturity, self-confidence; and a positive image when working with teammates or clients on construction projects.
- **Responsibility** - demonstrate dependability, consistency, and personal well-being when safely completing construction tasks.
- **Adaptability/Flexibility** - Foster creativity, new ideas, and resilience when working to solve problems in construction projects.
- **Self-motivated** - demonstrate a willingness to learn, independence, initiative, and a positive attitude when approaching new information

Standard 2

Students will display workplace skills related to the essential attitudes and abilities for success in the construction profession.

- **Communication** – Demonstrates skills in listening and speaking; communicates professionally with teammates, supervisors, and customers in relation to construction projects.
- **Decision making** – Analyzes key facts, data, and situations to employ reasoning skills for completing construction tasks.
- **Teamwork** – Builds trusting relationships, works cooperatively with others and utilizes individual strengths of team members when completing construction tasks.
- **Planning, organizing, and management** – Designs, prepares, and implements creative tasks within a desired timeframe; Sets priorities and responds to changing priorities.
- **Leadership** – Builds positive relationships and mitigates conflict.

Standard 3

Students will display technical skills that are grounded in design that deliver essential knowledge and competencies for success in the industry.

- **Computer and technology literacy**
- **Job specific skills**
- **Safety and health**
- **Service orientation** – responds to internal and external customers; demonstrates focus and presence; attends to personal matters away from the classroom.
- **Professional development** – demonstrates openness to learn, grow, and change in the construction industry.

Industry Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		

STRANDS AND STANDARDS
RESIDENTIAL CONSTRUCTION 2

Course Description

This course provides comprehensive training in essential construction skills, focusing on safety, tools, equipment, and foundational techniques. The curriculum covers shop safety, tools and equipment, applied math, construction plans, codes and regulations, wall systems, floor and stair systems, roof systems, building envelope, and interior finishes. Participants will learn to identify and mitigate safety hazards, use and maintain construction tools, accurately measure and mark projects, interpret construction plans, ensure compliance with codes and regulations, frame walls, floors, and roofs, install exterior and interior finishes, and manage building envelopes. The course equips participants with the knowledge and skills necessary for safe and effective construction practices in various roles within the construction industry.

Intended Grade Level	9-12
Units of Credit	0.5-1.0
Core Code	40.08.00.00.402
Concurrent Enrollment Core Code	40.08.00.13.402
Prerequisite	Residential Construction 1
Skill Certification Test Number	N/A
Skill Certification Cut Score	**N/A**
Test Weight	N/A
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Carpentry
Endorsement 2	Construction Management
Endorsement 3	Residential Construction

Updated: August 2025

STRAND 1: SHOP SAFETY

Students will learn and practice basic construction safety skills.

Standard 1

Identify potential safety hazards in a construction site or shop space.

- Power tools
- Hand tools
- Shop/Site Behavior
- Chemicals

Standard 2

Explain ways to mitigate safety concerns in a construction site or shop space.

- Training
- Procedures
- Cleanliness
- Personal Protective Equipment (PPE)

Performance Skills

- Perform a shop or site safety audit and report recommended solutions to potential hazards.
- Demonstrate safety practices and procedures based on regulations and requirements when working on a site or constructing a project.

STRAND 2: TOOLS & EQUIPMENT

Students will explore classifications of tools and their applications in construction.

Standard 1

Explain the uses of common construction tools and equipment.

- Hand tools
- Portable power tools
- Stationary tools
- Mobile equipment/machinery

Standard 2

List the proper care and maintenance procedures for common construction tools and equipment.

- Hand tools
- Portable power tools
- Stationary tools
- Mobile equipment/machinery

Standard 3

Discuss the types of power sources for tools and equipment.

- Corded
- Battery
- Pneumatic
- Hydraulic
- Combustion

Performance Skills

- Demonstrate safe and appropriate use of common construction tools and equipment when working on projects.
- Demonstrate proper care and maintenance of tools and equipment when working on projects.
- Pass relevant safety test(s) with 100% accuracy.

STRAND 3: CONSTRUCTION MATH

Students will use various construction measuring devices to accurately measure, calculate, and mark projects.

Standard 1

Demonstrate basic measurements in relation to construction.

- Square footage (flooring, sheetrock, etc.)
- Cubic yards (concrete, dirt, etc.)
- Conversions (feet, yards, inches, etc.)

Standard 2

Demonstrate use of measuring devices and methodologies.

- Traditional measuring tools (tape, optical transit, etc.)
- Electronic measuring tools (laser, GPS, etc.)
- Squaring tools (speed, framing, etc.)
- Leveling tools (bubble, laser, plumbob, etc.)

Performance Skills

- Accurately measure and mark within 1/16”.
- Accurately add, subtract, and divide measurements.
- Accurately convert between inches, feet, and yards.
- Accurately convert between civil and architectural units.
- Accurately calculate volumes and areas.
- Accurately square a project using various methods.
- Calculate the amount of materials required for a given construction project.
- Estimate the cost of materials for a given construction project.

STRAND 4: CONSTRUCTION PLANS

Students will read and interpret structural drawings, codes, specifications, and other construction documentation.

Standard 1

Identify and describe various types of construction drawings, including their fundamental components and features.

Standard 2

Identify various types of construction drawings.

Standard 3

Identify and describe the purpose of the five basic construction drawing components.

Standard 4

Identify and explain the use of dimensions and various drawing scales.

Standard 5

Explain the importance of specifications, including CSI Master format.

Standard 6

List items commonly shown on architectural drawings.

Standard 7

Describe information typically shown on structural drawings.

Standard 8

Explain the importance of referencing mechanical, electrical, and plumbing plans.

Standard 9

Identify and explain the significance of various drawing elements, such as lines of construction, symbols, and grid lines.

Performance Skills

- Read and interpret a civil drawing, specification, or other construction documentation.
- Demonstrate dimensions and drawing scales for a given project.
- Construct a three-dimensional construction project from a set of construction plans..

STRAND 5: CODES & REGULATIONS

Students will explore the impact of codes and regulations on construction projects.

Standard 1

Discuss the roles of codes and regulations on construction.

Standard 2

Discuss methods for ensuring construction projects meet legal requirements (local, state, and national building codes).

Standard 3

Describe procedures for obtaining a permit for construction projects.

Standard 4

Investigate best practices when coordinating inspections at various stages in the construction process.

Standard 5

Explain how a given construction project adheres to compliance standards.

- Regulations
- Safety
- Environmental
- Accessibility

Standard 6

Explore zoning laws and how they affect the use of land and types of structures that can be built in specific areas.

Performance Skills

- Maintain thorough records of permits, inspections, and compliance documentation for a construction project.
- Communicate with regulatory authorities, inspectors, and other stakeholders to ensure smooth project progression and address any issues that arise.
- Identify and resolve issues related to permits, inspections, and compliance to keep a project on track.

STRAND 6: WALL SYSTEMS

Students will demonstrate the procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners and partition Ts, bracing walls, and applying sheathing.

Standard 1

Identify the components of a wall system.

- Studs
- Plates
- Sheathing
- Insulation
- Vapor barrier
- Exterior cladding
- Interior finish
- Noggins
- Bracing
- Windows & doors

Standard 2

Compare wood and metal frames.

- Budget
- Environmental conditions
- Aesthetic preferences
- Project requirements and applications

Standard 3

Describe the correct procedure to lay out, assemble, erect, and brace exterior walls for a frame building.

Standard 4

Describe wall framing techniques used in masonry construction.

Standard 5

Explore alternative wall systems.

Standard 6

Compare standard and alternative interior wall systems.

- Materials
- Insulation
- Construction speed
- Aesthetics
- Sustainability

Standard 7

Describe modern masonry materials and techniques.

Standard 8

Explain how to mix mortar and lay masonry units.

Standard 9

Describe how to install both brick and concrete masonry units.

Performance Skills

- Correctly install sheathing on a wall.
- Prepare a rough opening for proper window installation.
- Prepare a rough opening for proper door installation.
- Frame the walls of a structure in compliance with codes and regulations.
- Efficiently manage time to complete building walls within the project timeline.
- Conduct a wall inspection to ensure all components meet quality standards.
- Identify and resolve issues related to a wall during construction.
- Effectively communicate with clients, architects, engineers, and regulatory authorities to ensure the walls meet all requirements.

STRAND 7: FLOOR & STAIR SYSTEMS

Students will demonstrate procedures and methods for installing floor and stair systems.

Standard 1

Identify the different types of framing systems.

- Platform-framed
- Trus Joist® I-Joists (TJI), I-Beam, and other trusses.
- Post-and-beam

Standard 2

Label floor system components and their functions.

- Sill plate
- Beams
- Girders
- Supports
- Joists
- Bridging
- Underlayment
- Subfloor
- Shields & sealers

Standard 3

Describe the construction methods and procedures for installing common floor system components.

Standard 4

Label the structural components of stairs and their functions.

- Treads
- Risers
- Stringers
- Handrail

Standard 5

Discuss load-bearing principles and how to reinforce stairs for stability.

Performance Skills

- Estimate the amount of material to frame a floor assembly from a set of plans.
- Lay out and construct a floor assembly, including a rough opening and subfloor material.
- Frame a floor system in compliance with codes and regulations..
- Construct a stair system in compliance with codes and regulations.
- Efficiently manage time to complete floor and stair work within the project timeline.
- Conduct a floor and stair inspection to ensure all components meet quality standards.
- Identify and resolve issues related to the floor and stairs during construction.
- Effectively communicate with clients, architects, engineers, and regulatory authorities to ensure the floor and stairs meet all requirements.

STRAND 8: ROOF SYSTEMS

Students will demonstrate procedures and methods for installing floor systems.

Standard 1

Identify common types of roofs used in residential construction.

- Gable
- Dutch Hip
- Flat
- Shed

Standard 2

Describe the use of trusses in basic roof framing.

- Types
- Components
- Installation
- Bracing

Standard 3

Illustrate the steps to erecting a gable roof.

- Rafters
- Dormers
- Framing Square
- Openings
- Sheathing

Standard 4

Label the components of ceiling framing and their functions.

Standard 5

Describe how to perform a material takeoff for a roof.

Standard 6

Compare the different roofing system materials and their preferred applications.

- Composition
- Roll-roofing
- Wood shakes and shingles
- Tile/slate
- Metal
- Built-up
- Single ply
- Fasteners used on roofing projects.

Standard 7

Describe the installation techniques for common roofing systems.

- Roof deck
- Underlayment and waterproof membrane
- Drip edge
- Flashing
- Roof ventilation
- Composition shingles
- Metal roofing
- Roll roofing

Performance Skills

- Frame a roof in compliance with codes and regulations.
- Efficiently manage time to complete roofing work within the project timeline.
- Conduct a roof inspection to ensure all components meet quality standards.
- Identify and resolve issues related to the roof during construction.
- Effectively communicate with clients, architects, engineers, and regulatory authorities to ensure the roof meets all requirements.

STRAND 9: BUILDING ENVELOPE

Students will analyze methods and materials used in the building envelope.

Standard 1

Assess how air, moisture, heat, and light interact with building materials and systems.

Standard 2

Compare common materials used in building envelopes.

- Insulation (interior, exterior, extruded, expanded, etc.)
- Vapor barrier
- Cladding
- Sealants

Standard 3

Discuss the impacts building envelopes have on a structure.

- Energy efficiency
- Weather protection
- Moisture control
- Airflow management

Standard 4

Identify trims used in exterior insulation and finish systems (EIFS).

Standard 5

Distinguish between traditional and water management EIFS.

Standard 6

Distinguish between traditional hard-coat plaster and synthetic finishes.

Standard 7

Describe building features commonly created with glass fiber reinforced concrete (GFRC).

Performance Skills

- Demonstrate the proper use of bonding agents, sealers, and sealants.
- Install insulation materials in compliance with codes and regulations.
- Efficiently manage time to complete building envelope work within the project timeline.
- Conduct a building envelope inspection to ensure all components meet quality standards.
- Identify and resolve issues related to the building envelope during construction.
- Effectively communicate with clients, architects, engineers, and regulatory authorities to ensure the building envelope meets all requirements.

STRAND 10: INTERIOR FINISHES

Students will explore common interior finishes and related functional components.

Standard 1

Explore various interior finishes and their impact on the aesthetics and functionality of a space.

- Wall detailing
- Flooring
- Ceiling detailing
- Trim and molding
- Cabinetry and millwork
- Countertops

Standard 2

List the steps for preparing interior surfaces for finish work (sanding, priming, cleaning, etc.)

Standard 3

Assess various materials and their appropriateness for a specific finish project.

- Drywall
- Paint
- Trim
- Flooring

Standard 4

Show installation techniques for various interior finishes.

- Trim
- Molding
- Cabinetry
- Flooring

Performance Skills

- Identify and resolve issues that arise during the finishing process.
- Efficiently manage time to complete finish work within the project timeline.
- Identify and resolve issues related to the building envelope during construction.
- Effectively communicate with clients, designers, and other team members to ensure that finishes meet expectations and specifications.

STRAND 11: DURABLE SKILLS

These standards will not appear on state skill certification exams but should be taught throughout the duration of the course.

Standard 1

Students will display personal skills related to the essential values, personality traits, and personal characteristics for success in the construction profession and life.

- **Integrity** - demonstrate honesty and personal responsibility for actions.
- **Work ethic** - demonstrate tenacity, hard work, excellence, punctuality, meet deadlines; and be self-directed when completing tasks in the construction professional setting.
- **Professionalism** - demonstrate maturity, self-confidence; and a positive image when working with teammates or clients on construction projects.
- **Responsibility** - demonstrate dependability, consistency, and personal well-being when safely completing construction tasks.
- **Adaptability/Flexibility** - Foster creativity, new ideas, and resilience when working to solve problems in construction projects.
- **Self-motivated** - demonstrate a willingness to learn, independence, initiative, and a positive attitude when approaching new information

Standard 2

Students will display workplace skills related to the essential attitudes and abilities for success in the construction profession.

- **Communication** – Demonstrates skills in listening and speaking; communicates professionally with teammates, supervisors, and customers in relation to construction projects.
- **Decision making** – Analyzes key facts, data, and situations to employ reasoning skills for completing construction tasks.
- **Teamwork** – Builds trusting relationships, works cooperatively with others and utilizes individual strengths of team members when completing construction tasks.
- **Planning, organizing, and management** – Designs, prepares, and implements creative tasks within a desired timeframe; Sets priorities and responds to changing priorities.
- **Leadership** – Builds positive relationships and mitigates conflict.

Standard 3

Students will display technical skills that are grounded in design that deliver essential knowledge and competencies for success in the industry.

- **Computer and technology literacy**
- **Job specific skills**
- **Safety and health**
- **Service orientation** – responds to internal and external customers; demonstrates focus and presence; attends to personal matters away from the classroom.
- **Professional development** – demonstrates openness to learn, grow, and change in the construction industry.

Industry Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		

STRANDS AND STANDARDS
CONSTRUCTION CAPSTONE

Course Description

This course offers hands-on experience in managing real-world construction projects relevant to a student's previous program training (electrical, plumbing, carpentry, masonry, etc.). Students will develop comprehensive project proposals, allocate resources, and create project schedules using management tools and techniques. They ensure compliance with relevant codes, and select appropriate materials while learning various construction methods and safety protocols. The course emphasizes teamwork, professional communication, and industry engagement through mentorship and real-world applications. By the end of the course, students will be equipped with the skills and knowledge necessary to pursue further education or careers in the construction industry, having gained practical experience and professional insights.

Intended Grade Level	11-12
Units of Credit	0.5
Core Code	40.08.00.00.403
Concurrent Enrollment Core Code	N/A
Prerequisite	N/A
Skill Certification Test Number	N/A
Skill Certification Cut Score	**N/A**
Test Weight	N/A
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Plumbing
Endorsement 2	Electrician
Endorsement 3	Residential Construction (Construction Management/Carpentry)

STRAND 1: PROJECT PLANNING & MANAGEMENT

Students will collaboratively plan and manage an approved construction project relevant to their previous program training (electrical, plumbing, carpentry, HVAC, masonry, etc.). This project may be sourced by industry partners, school programs, or the instructor.

Standard 1

Investigate key elements of a successful project proposal and planning for construction.

- Objectives
- Scope
- Timeline
- Budget

Standard 2

Assess and select critical resources needed to complete the approved construction project.

- Personnel
- Materials
- Vendors
- Time
- Funding
- Site or location

Standard 3

Explore methods for allocating resources effectively during the project.

- Scheduling software or tools
- Team roles and responsibilities
- Communication plans
- Deadlines

Performance Skills

- Create a detailed project proposal for a construction-related project. Present it to an outside industry professional for feedback.
- Develop a Gantt chart or similar project schedule and adjust it based on project needs and constraints.
- Participate in team meetings, document project progress, and resolve conflicts effectively.

STRAND 2: MATERIALS, TECHNIQUES, & METHODS

Students will collaboratively complete and present an approved construction project relevant to their previous program training (electrical, plumbing, carpentry, HVAC, masonry, etc.). This project may be sourced by industry partners, school programs, or the instructor.

Standard 1

Identify an appropriate blueprint for the industry-related construction project.

Standard 2

Select appropriate construction materials needed for the project.

Standard 3

Explain the construction methods and processes required to complete the project.

Standard 4

Describe safety considerations and concerns associated with the construction site and project.

- Workplace conditions
- Potential hazards
- Safety standards
- Equipment use
- Personal Protective Equipment (PPE)

Performance Skills

- Research local, state, and federal building codes and regulations; confirm the approved blueprint and plans are in compliance.
- Create a comprehensive materials list and estimated cost.
- Develop a safety plan for the approved construction-related project.
- Demonstrate proficiency in relevant construction methods.
- Pass relevant safety test(s) with 100% accuracy.
- Demonstrate safety practices and procedures based on regulations and requirements when working on a site or constructing a project.
- Complete the approved construction-related project.
- Present the completed project to an industry professional and peers.

STRAND 3: DURABLE SKILLS

These standards will not appear on state skill certification exams but should be taught throughout the duration of the course.

Standard 1

Students will display personal skills related to the essential values, personality traits, and personal characteristics for success in the construction profession and life.

- **Integrity** - demonstrate honesty and personal responsibility for actions.
- **Work ethic** - demonstrate tenacity, hard work, excellence, punctuality, meet deadlines; and be self-directed when completing tasks in the construction professional setting.
- **Professionalism** - demonstrate maturity, self-confidence; and a positive image when working with teammates or clients on construction projects.
- **Responsibility** - demonstrate dependability, consistency, and personal well-being when safely completing construction tasks.
- **Adaptability/Flexibility** - Foster creativity, new ideas, and resilience when working to solve problems in construction projects.
- **Self-motivated** - demonstrate a willingness to learn, independence, initiative, and a positive attitude when approaching new information

Standard 2

Students will display workplace skills related to the essential attitudes and abilities for success in the construction profession.

- **Communication** – Demonstrates skills in listening and speaking; communicates professionally with teammates, supervisors, and customers in relation to construction projects.
- **Decision making** – Analyzes key facts, data, and situations to employ reasoning skills for completing construction tasks.
- **Teamwork** – Builds trusting relationships, works cooperatively with others and utilizes individual strengths of team members when completing construction tasks.
- **Planning, organizing, and management** – Designs, prepares, and implements creative tasks within a desired timeframe; Sets priorities and responds to changing priorities.
- **Leadership** – Builds positive relationships and mitigates conflict.

Standard 3

Students will display technical skills that are grounded in design that deliver essential knowledge and competencies for success in the industry.

- **Computer and technology literacy**
- **Job specific skills**
- **Safety and health**
- **Service orientation** – responds to internal and external customers; demonstrates focus and presence; attends to personal matters away from the classroom.
- **Professional development** – demonstrates openness to learn, grow, and change in the construction industry.

Digital Technology

Cybersecurity		
Course Code	**Course**	**Changes**
35.02.00.00.030	Computer Programming 1	Revised to better fit succession of CP 1, CP 2, CP Advanced, CP Capstone
35.02.00.00.032	Computer Programming 2	Revised to better fit succession of CP 1, CP 2, CP Advanced, CP Capstone
35.02.00.00.040	Computer Programming Advanced	Added SEEd Standards to Strands. Revised to better fit succession of CP 1, CP 2, CP Advanced, CP Capstone
35.02.00.00.035	Computer Science Principles	Added SEEd Standards to Strands. Revised to better align with the AP version and to make a better distinction between ECS and CSP.
35.02.00.00.007	Exploring Computer Science	Revised to make it more of an entry level course to better align with the Digital Studies credit requirement. Also to make a better distinction between ECS and CSP.
35.02.00.00.005	Into to Information Technology & Cybersecurity	Revised to remove Web Dev and added Cybersecurity to give course more of a breadth to all areas of Information Technology.

STRANDS AND STANDARDS
COMPUTER PROGRAMMING 1

Learning that works for Utah
CTE®

Course Description

This foundational course introduces students to the core principles of software engineering and computer programming. Through hands-on experience, students will learn to design, write, and test their own programs while applying key mathematical concepts. The course emphasizes problem-solving, logical thinking, and the development of basic coding skills using industry-relevant tools and practices. Teachers guide students through real-world scenarios to build confidence and competence in software development.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	35.02.00.00.030
Concurrent Enrollment Core Code	35.02.00.13.030
Prerequisite	Computer Science Principles
Skill Certification Test Number	820 You can also view the test chart HERE for industry exams
Skill Certification Cut Score	**73%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Intro to Computer Science
Endorsement 2	Programming & Software Development
Endorsement 3	Web Development
Endorsement 4	Information Technology Systems

Updated: August 2025

STRAND 1

Students will be familiar with and use a programming language IDE (Integrated Development Environment).

Standard 1

Demonstrate concept knowledge of different languages.

- Students will be aware of several programming languages and their purposes or use cases
  - Python - data science
  - Java - desktop application and server-side software
  - SQL - databases
  - JavaScript - web apps
  - C# - desktop applications
  - R - math and graphs
  - C++ - video games, desktop applications
  - C - operating systems, embedded systems
- Describe the difference between an interpreted language vs a compiled language
- Identify characteristics of high-level and low-level languages

Standard 2

Demonstrate the ability to use an IDE.

- Use an IDE to develop, compile, and run programs
- Understand the difference between syntax, run-time, and logic errors
- Use the debugger to identify errors

Performance Skills

Use an IDE to create a solution to solve a problem.

STRAND 2

Students will understand program development methodology and best practices.

Standard 1

Demonstrate the ability to use good programming style.

- Demonstrate proper use of white space (between lines and indentation)
- Use appropriate naming conventions for identifiers (variables, methods, functions, and file names)
- Understand the appropriate use of constants versus variables in programming style
- Construct identifiers with meaningful format; camelCase and underscore
- Implement appropriate output formatting (decimal places, dollar signs, and correct placement of variable data in a sentence)

Standard 2

Understand the ordered software development life cycle.

- Identify the members of a computer programming/software engineering team:
  - team leader
  - analyst
  - senior developer
  - junior developer
  - client/subject matter expert
- Requirements Analysis: Identify specifications and understand requirements to create a solution to a problem
- Planning/Design: Design an algorithm to solve the problem using appropriate documentation (single, multi-line, and/or documentation comments, flowcharts, etc.)
  - Define an algorithm
  - Break the problem down into its subcomponents using top-down design
- Implementation: Write the code, with comments, to implement the algorithm
- Testing: Test program for verification of errors and proper functionality
- Release and Maintenance: Release the solution and provide updates when necessary

Performance Skills

Demonstrate knowledge of program development methodology through a project.

STRAND 3

Students will understand and implement key programming concepts.

Standard 1

Understand and implement input and output commands.

- Understand the difference between input and output
- Understand there are different types of input (file, keyboard, mouse, microphone)
- Understand there are different types of output (speakers, monitor, printer, file)
- Write a program that receives input from a keyboard and produces output to the display

Standard 2

Understand and implement data types and variables.

- Differentiate between primitive data types (boolean, integer, float and string)
- Identify proper use of primitive data types (when to use one versus another)
- Declare a variable and assign it a value using the assignment operator
- Understand the difference between declaring and initializing a variable

Standard 3

Understand and implement operators and operands.

- Use basic arithmetic operators (modulus, multiplication, integer division, float division, addition, subtraction)
- Use basic comparison operators (<, >, ==, >=, <=)
- Use basic assignment operator (=)
- Understand order of operations for all operators
  - Parenthesis
  - Exponent
  - Multiplication
  - Division
  - Modulus
  - Addition
  - Subtraction
- Use basic logical operators (AND, OR, NOT)
- Use operands in conjunction with arithmetic, relational, and logical operators

Standard 4

Understand and implement expressions in a program.

- Understand how operators and operands are used to form expressions
- Identify and implement syntactically correct expressions
  - Possible examples: A OR B, 5==6, x !=3.142, x = 4, y + 7

Standard 5

Understand and implement functions.

- Understand and properly define scope, local variable, and global variable
- Understand what functions are and what they are used for (readability, reusability, modularity, abstraction)
- Understand the difference between a built-in function and user defined function
- Utilize built-in functions
- Understand that functions may or may not require arguments (input(s))
- Understand that functions may or may not return value(s) (output(s))

Standard 6

Understand and implement complex data types.

- Understand the difference between simple and complex/primitive and reference data types
- Declare a string variable in a program

Performance Skills

Write one or more programs that demonstrate effective use of the key programming concepts defined in Strand 3.

STRAND 4

Understand and implement control structures.

Standard 1

Understand and implement IF statements in a program.

- IF
  - Understand when to use an IF statement
  - Demonstrate correct use of an IF statement
- ELSE-IF
  - Understand when to use an ELSE-IF statement
  - Demonstrate correct use of ELSE-IF statements
- ELSE
  - Understand when to use an ELSE statement
  - Demonstrate proper use of an ELSE statement
- Nesting IF statements
  - Understand when to use a nested IF statement
  - Demonstrate proper use of a nested IF statement

Students will be able to read a program and know which if statement will execute during a given situation and which will be ignored

Standard 2

Understand and implement basic loop structures in programs.

- For-loops
  - Understand when to use a for-loop
    - When you know the number of times you are going to iterate
  - Understand the three components of a for-loop
    - An initial value (i = 0)
    - A condition (i < 7)
    - An update expression (i = i + 1)
  - Demonstrate proper use of for-loops
- While-loops
  - Understand when to use a while-loop
    - When you want to stop iterating when a boolean condition is no longer true
  - Demonstrate proper use of a while-loop
- Nested loops (loop within a loop)
    - Understand when to use nested loops
    - Demonstrate proper use of nested loops
- Identify the various ways that loops can end (break, met condition, condition fail)
- Design loops so they iterate the correct number of times
- Understand what causes an infinite loop

Standard 3

Understand and implement expressions and complex conditions in control structures.

- Create expressions using relational operators
  - Example: (a > 6, x != 7, y > 4)
- Form complex conditions using logical operators
  - Example: (a > 6 AND x != 7 OR y > 4)
- Incorporate complex conditions in loop structures
  - Example: While a player's health is greater than 50 and player is not dead

Performance Skills

Write one or more programs that demonstrate effective use of control structures.

STRAND 5

Students will be aware of career opportunities in the Computer Programming/Software Engineering industry and ethical applications.

Standard 1

Investigate career opportunities, trends, and requirements related to computer programming/software engineering careers.

- Understand the role each team member plays in a computer programming/software engineering team:
  - team leader
  - analyst
  - senior developer
  - junior developer
  - client/subject matter expert
- Describe work performed by each member of the computer programming/software engineering team
- Investigate trends and traits associated with computer programming/software engineering careers (creativity, technical, leadership, collaborative, problem solving, design, etc.)
- Discuss related career pathways

Standard 2

Understand current ethical issues dealing with computer programming and information in society.

- Explain the impact software can have on society (i.e., privacy, piracy, copyright laws, ease of use, etc.)
- Explain the ethical reasons for creating reliable and robust software
- Describe how computer-controlled automation affects a workplace and society
- Understand how AI impacts the programming field.
- Explain why you should not use AI to write your code as a beginner programmer.
- Understand that AI tools can be helpful for debugging code, but it's important to double-check their suggestions using your own programming knowledge.

Performance Skills

Develop awareness of career opportunities in the computer programming/software engineering industry ethical applications.

Skill Certification Test Points by Strand

Computer Programming 1 – VOCABULARY

Strand 1 - Students will be familiar with and use a programming language IDE (Integrated Development Environment).

IDE (Integrated Development Environment: Software for building applications that combines common developer tools in a single interface.

Interpreted Language: Source code is read and executed by an interpreter

Compiled Language: Source code is translated into machine code, and the machine code is stored in a separate file.

High-Level Language: Programming Language that enables a programmer to write programs that are closer to human language.

Low-Level Language: Programming language that contains basic instructions recognized by a computer.

Syntax Error: Error which is detected and prevents the program from running.

Run-Time Error: Error in the code that occurs while the program is running.

Logic Error: Mistake in the code that produces incorrect results.

Debugging: Finding and fixing problems in an algorithm or program.

Software Development Life Cycle: A process that produces software with the highest quality and lowest cost in the shortest time possible

Strand 2 - Students will understand program development methodology and best practices.

White Space: Blank lines and extra spacing to improve readability of code.

Identifiers: Names given to variables, constants, methods, and functions.

Variable: A named value within a program.

Function: A named group of programming instructions.

Constant: Data values that stay the same every time a program is executed.

Camel Case: Naming convention where the first letter of name is lowercase, and each new word is capitalized. (camelCase)

Pascal Case: Naming convention where the first letter of each compound word is capitalized. (PascalCase)

Snake Case: Naming convention where spaces are replaced with underscores. (snake_case)

Software Development Life Cycle:
1. Requirements Analysis - Identify specifications and understand requirements to create a solution.
2. Planning/Design - Design an algorithm to solve the problem using appropriate documentation.
3. Implementation - Write the code
4. Testing - Test program for verification of errors and proper functionality.
5. Release & Maintenance - Release the solution and provide updates when necessary.

Algorithm: A finite set of instructions that accomplish a task.

Strand 3 - Students will understand and implement key programming concepts.

Scope: Determines the accessibility (visibility) of variables.

Local Variable: Only recognized inside the function in which it is declared.

Global Variable: Recognized from anywhere inside a program.

Input: The information computers get from users, devices, or other computers.

Output: The information computers give to users, devices, or other computers.

String: An ordered sequence of characters.

Integer: A data type that is used for a whole number

Boolean: A data type that is either true or false.

Float: A data type that is used for fractional values in decimal format.

Declaration: Stating the name and data type of a variable.

Initialization: Assignment of an initial value for a variable.

Arithmetic Operators: Includes addition, subtraction, multiplication, division, and modulus operators.

Comparison Operators: <, >, ≤, ≥, ==, ≠ indicate a Boolean expression.

Order of Operations: Parenthesis, exponents, multiplication, modulus, division, addition, subtraction (PEMMDAS).

Logical Operators: NOT, AND, and OR, which evaluate to a Boolean value.

Expression: A combination of operators, constants, and variables.

Integer Division: Division in which the fractional part (remainder) is discarded.

Float Division: Division in which the fractional part (remainder) is included with a certain number of values after the decimal.

Function: A named group of programming instructions

Readability: The ease with which the code is read and understood.

Reusability: Capability of being used again or repeatedly.

Modularity: Enables reusability and minimizes duplication.

Abstraction: Hiding unnecessary details from the user.

Built-In Function: Any function that is provided as part of a high-level language and can be executed by a simple reference with specification of arguments.

User-Defined Function: A function created by the user.

Arguments: The variables given to the function for execution.

Parameters: The names listed in the method/function's definition.

Return: A value that is sent back to the user by a method/function.

Void Return: Indicates that the function does not return a value.

Simple Data Types: char, string, integer, float, double, boolean.

Complex Data Types: enumeration, array, list, object.

Strand 4 - Understand and implement control structures

Conditional Statement: Decision making based on a Boolean value.

Nested IF Statement: An if statement placed inside another if statement.

For Loop:
Initial Value
Condition
Increment/Decrement

While Loop: Loops through a block of code as long as a specified condition is true.

Nested Loop: A loop placed inside another loop.

Break: Statement used to immediately terminate a loop.

Met Condition: Expression evaluates to true.

Failed Condition: Expression evaluates to false.

Iterate: Each cycle through a loop.

Infinite Loop: A loop that, due to a logic error, will continue endlessly.

Complex Condition: Formed by combining multiple conditions with logical operators.

Exit Condition: Used to exit a loop.

Strand 5 - Students will be aware of career opportunities in Computer Programming/Software Engineering industry and ethical applications.

Computer Programming/Software Engineering Team:

- Team Leader
- Analyst
- Senior Developer
- Junior Developer
- Client/Subject-Matter Expert

Computer Programming 1 - Skills Reference Sheet

Assignment, Display, and Input	
`a = expression`	Evaluates `expression` and then assigns a copy of the result to the variable a.
`DISPLAY(expression)`	Displays the value of `(expression)` in the console window.
`INPUT( )`	Accepts a value from the user and returns the input value.
Arithmetic Operators and Numeric Procedures	

`a + b`
`a - b`
`a * b`
`a / b`
	The arithmetic operators `+, -, *,` and `/` are used to perform arithmetic on `a` and `b`.
	
	For example, `17 / 5` evaluates to `3.4`.
	
	The order of operations used in mathematics applies when evaluating expressions.

`a MODULUS b`
-or-
`a MOD b`
	Evaluates to the remainder when `a` is divided by `b`.
	
	For example, `17 MOD 5` evaluates to `2`.
	
	`MODULUS (MOD)` has the same precedence as the `*` and `/` operators.

Relational and Boolean Operators	
`NOT condition`	Evaluates to `true` if `condition` is `false`; otherwise evaluates to `false`.
`condition1 AND condition2`	Evaluates to `true` if both `condition1` and `condition2` are `true`; otherwise evaluates to `false`.
`condition1 OR condition2`	Evaluates to `true` if `condition1` is `true` or if `condition2` is `true` or if both `condition1` and `condition2` are `true`; otherwise evaluates to `false`.

`FOR(condition)`
`{`
`  <block of statements>`
`}`
	The code in `<block of statements>` is executed a certain number of times.

`WHILE(condition)`
`{`
`  <block of statements>`
`}`
	The code in `<block of statements>` is repeated until the `(condition)` evaluates to `false`.

`IF(condition1)`
`{`
`  <first block of statements>`
`{`
`ELSE IF(condition2)`
`{`
`  <second block of statements>`
`}`
`ELSE`
`{`
`  <third block of statements>`
`}`
	If `(condition1)` evaluates to `true`, the code in `<first block of statements>` is executed; if `(condition1)` evaluates to `false`, then `(condition2)` is tested; if `(condition2)` evaluates to `true`, the code in `<second block of statements>` is executed; if both `(condition1)` and `(condition2)` evaluate to `false`, then the code in `<third block of statements>` is executed.

Procedures and Procedure Calls	

`PROCEDURE procName( )`
`{`
`  <block of statements>`
`}`
	Defines `procName` as a procedure that takes no arguments. The procedure contains `<block of statements>`.
	
	The procedure `procName` can be called using the following notation:
	
	`procName( )`

STRANDS AND STANDARDS
COMPUTER PROGRAMMING 2

Learning that works for Utah
CTE®

Course Description

This course builds on foundational programming skills by introducing students to more advanced concepts and techniques. Students will deepen their understanding of software development through hands-on projects that emphasize problem-solving, algorithmic thinking, and code optimization. Using a high-level programming language such as Java, Python, C++, or C#, students will design and implement complex applications, explore object-oriented programming, and apply debugging and testing strategies. The course also encourages ethical and responsible coding practices, preparing students for further study or entry-level programming roles.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	35-02-00-00-032
Concurrent Enrollment Core Code	35-02-00-13-032
Prerequisite	Computer Programming 1
Skill Certification Test Number	822 - C++ 824 - Java 827 - Python 828 - C#
Skill Certification Cut Score	**822 – C++ – 75%** **824 – Java – 74%** **827 – Python – 73%** **828 – C# – 71%** You can also view the test chart HERE for industry exams
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Intro to Computer Science
Endorsement 2	Programming & Software Development

Updated: August 2025

STRAND 1

Students will demonstrate static (array), dynamic (vector, Arraylist, etc.) list structures, and strings.

Standard 1

Demonstrate the ability to use static arrays/lists in programs.

- Declare and initialize arrays/lists of all applicable types
- Perform data input to and output from arrays/lists
- Perform operations on arrays/lists including sort arrays
- Iterate through the structure (i.e., for-each, enhanced for, or iterators)

Standard 2

Demonstrate the ability to use dynamic arrays/lists (i.e. vectors, Arraylist, or generic lists).

- Declare and initialize a dynamic array/list
- Add and remove items from the array/list
- Output data from arrays/lists
- Perform operations on arrays/lists
- Iterate through the structure (i.e. for-each, enhanced for, or iterators)
- Use a loop to iterate through the structure

Standard 3

Demonstrate the ability to use strings in programs.

- Compare string values
- Find the length of a string
- Copy part or all of string values into other strings
- Concatenate string values
- Locate substring positions
- Insert strings into other strings

Performance Skills

Students demonstrate mastery of static and dynamic arrays, lists, and strings in projects.

STRAND 2

Students will properly use sequential files.

Standard 1

Demonstrate the ability to use sequential files in programs.

- Create and initialize sequential files
- Store data to sequential files
- Retrieve data from sequential files
- Update sequential files

Standard 2

Demonstrate how to use an API in program development.

If students do not have access to use APIs directly, the teacher may provide a demonstration instead.

Performance Skills

Demonstrate sequential file access utilizing reading and writing operations.

STRAND 3

Create user defined functions/methods/procedures using top-down design and functional decomposition.

Standard 1

Students will understand and properly apply scope.

- Understand that variables and functions/methods/procedures have scope, which influences where they can be declared and accessed
- Declare and access local variables in a program
- Declare and access global variables in a program

Standard 2

Students will understand and implement function/methods/procedures inputs and outputs.

- Understand the correlation between arguments (inputs) and parameters (variables)
- Understand that functions/methods/procedures may or may not require arguments
- Understand that functions/methods/procedures may or may not return values
- Define functions/methods/procedures:
  - with parameters
  - without parameters
  - with return values
  - without return values
  - default parameters

Standard 3

Students will understand and implement functional decomposition. (Breaking a program down into one or more functions/methods/procedures.)

- Identify repetitive or redundant code in an application
- Understand the role abstraction plays in computer programming
- Demonstrate how to abstract multiple steps into a function/method/procedure
- Identify the characteristics of a well-defined function/method/procedure
  - Examples: shorter code, efficiency, reduced memory consumption, high reliability, readability, abstraction

Performance Skills

Create several user defined functions/methods/procedures with and without inputs and/or return values.

STRAND 4

Students will properly demonstrate object-oriented programming techniques.

Standard 1

Demonstrate the ability to use built-in classes.

- Instantiate objects
- Use object data members (i.e., Java's arr. length)
- Use object member functions (methods)

Standard 2

Demonstrate the ability to create user-defined classes.

- Create and use data members (instance variables)
- Create a constructor to initialize the data members
- Create and use member functions (methods)

Performance Skills

Properly employ object-oriented programming techniques.

STRAND 5

Students will properly demonstrate code comprehension and debugging techniques.

Standard 1

Demonstrate the ability to comprehend code outcomes.

- Tracing - Cognitively following the passes of a loop, nested function calls, change in value of global and local scoped variables, etc.
- Debugging - Utilizing 3rd party tools (IDE's) to step through a program and troubleshoot
- Testing - Validating the outputs of a program and testing its robustness. (i.e., boundary conditions, invalid inputs, unexpected scenarios, incorrect results, etc.)

Performance Skills

Demonstrate code comprehension and debugging techniques by tracing, debugging, and testing programs.

STRAND 6

Students will apply appropriate programming skill as an effective member of a team demonstrating the ability to collaborate with others.

Standard 1

Demonstrate the ability to apply knowledge to a programming project.

- Formalize specifications
- Choose proper input parameters
- Choose appropriate data structures and processing
- Design appropriate output
- Use appropriate test data
- Write good documentation

Standard 2

Demonstrate the ability to use teamwork and collaboration in a programming project.

- Divide a project among programmers
- Present work to a group
- Coordinate work with others in the group
- Complete assigned work according to predetermined deadlines
- Participate in a peer performance evaluation
- Demonstrate professionalism in team relationships, communication, timeliness, and attitude

Performance Skills

Apply appropriate programming skills as an effective member of a team.

STRAND 7

Students will demonstrate knowledge of current ethical issues dealing with computers and information in a global society.

Standard 1

Demonstrate knowledge of the social and ethical consequences of computers.

- Explain the ethical reasons for creating reliable and robust software
- Explain the impact software can have on society (i.e., privacy, piracy, copyright laws, ease of use, ete.)
- Show how security concerns can be addressed in an application (i.e., biometrics, passwords, information hiding, etc.)
- Describe how computer-controlled automation affects a workplace and society
- Give examples of ways to protect information on computer systems (attacks, viruses, malware, etc.)

Performance Skills

Demonstrate knowledge of current ethical issues dealing with computers and information in society.

STRAND 8

Students will be aware of career opportunities in the Computer Programming/Software Engineering industry and of its history.

Standard 1

Investigate career opportunities, trends, and requirements related to computer programming/software engineering careers.

- Identify the members of a computer programming/software engineering team: team leader, analyst, senior developer, junior developer, and client/subject matter expert
- Describe work performed by each member of the computer programming/software engineering team
- Investigate trends and traits associated with computer programming/software engineering careers (creativity, technical, leadership, collaborative, problem solving, design, etc.)
- Discuss related career pathways

Performance Skills

Develop awareness of career opportunities in the computer programming/software engineering industry and of its history.

Skill Certificate Test Points by Strand

Will be updated after the test is written.

Computer Programming 2 Vocabulary

Strand 1 - Students will demonstrate static (Array), dynamic (Vector, Array/List, etc.) list structures, and strings.

Declaration: Stating the name and data type of a variable.

Initialization: Assignment of an initial value for a variable.

Iterate: Each cycle through a loop.

Dynamic Array/List: An Array/List that is able to change its size during program execution.

Static Array/List: Static arrays have their size or length determined when the array is created and/or allocated. For this reason, they may also be referred to as fixed-length arrays or fixed arrays.

Concatenate: Operation of joining two strings together.

Substring: Contiguous sequence of characters within a string.

Strand 2 - Students will properly use sequential files

Sequential File: A sequential file **contains records organized by the order in which they were entered.** The order of the records is fixed. Records in sequential files can be read or written only sequentially.

Strand 3 - Create user defined functions using top-down design and functional decomposition.

Scope: Determines the accessibility (visibility) of variables.

Local Variable: Only recognized inside the function in which it is declared.

Global Variable: Recognized from anywhere inside a program.

Arguments: The variables given to the function for execution. (Inputs)

Parameters: The names listed in the method/function's definition. (Variables)

Return: A value that is sent back to the user by a method/function.

Strand 4 - Students will properly demonstrate object-oriented programming techniques.

Method(There are both user defined methods and built in language specific methods): A method is a programmed procedure that is defined as part of a class and included in any object of that class

Instance Variables: If the value of a variable varies from object to object, then such variables are called instance variables.

Data Members: A class variable or instance variable that holds data associated with a class and its objects

Instantiate Objects: The combined process of “make me a new object” and “get its settings initialized to the factory default settings” is called instantiation

Constructor: A constructor **is a special method of a class or structure in object-oriented programming that initializes a newly created object of that type.** Whenever an object is created, the constructor is called automatically.

Strand 5 - Students will properly demonstrate code comprehension and debugging techniques.

IDE: An integrated development environment (IDE) is software for building applications that combines common developer tools into a single graphical user interface (GUI).

Strand 6 - Students will apply appropriate programming skills as an effective member of a team demonstrating the ability to collaborate with others.
NONE

Strand 7 - Students will demonstrate knowledge of current ethical issues dealing with computers and information in a global society.
NONE

Strand 8 - Students will be aware of career opportunities in the Computer Programming/Software Engineering industry and of its history.

Computer Programming/Software Engineering Team:

- Team Leader
- Analyst
- Senior Developer
- Junior Developer
- Client/Subject-Matter Expert

Skills Reference Sheet

Assignment, Display, and Input	
`a = expression`	Evaluates `expression` and then assigns a copy of the result to the variable a.
`DISPLAY(expression)`	Displays the value of `(expression)` in the console window.
`INPUT( )`	Accepts a value from the user and returns the input value.
Arithmetic Operators and Numeric Procedures	

`a + b`
`a - b`
`a * b`
`a / b`
	The arithmetic operators `+, -, *,` and `/` are used to perform arithmetic on `a` and `b`.
	
	For example, `17 / 5` evaluates to `3.4`.
	
	The order of operations used in mathematics applies when evaluating expressions.

`a MODULUS b`
-or-
`a MOD b`
	Evaluates to the remainder when `a` is divided by `b`.
	
	For example, `17 MOD 5` evaluates to `2`.
	
	`MODULUS (MOD)` has the same precedence as the `*` and `/` operators.

Relational and Boolean Operators	
`NOT condition`	Evaluates to `true` if `condition` is `false`; otherwise evaluates to `false`.
`condition1 AND condition2`	Evaluates to `true` if both `condition1` and `condition2` are `true`; otherwise evaluates to `false`.
`condition1 OR condition2`	Evaluates to `true` if `condition1` is `true` or if `condition2` is `true` or if both `condition1` and `condition2` are `true`; otherwise evaluates to `false`.

`FOR(condition)`
`{`
`  <block of statements>`
`}`
	The code in `<block of statements>` is executed a certain number of times.

`WHILE(condition)`
`{`
`  <block of statements>`
`}`
	The code in `<block of statements>` is repeated until the `(condition)` evaluates to `false`.

`IF(condition1)`
`{`
`  <first block of statements>`
`{`
`ELSE IF(condition2)`
`{`
`  <second block of statements>`
`}`
`ELSE`
`{`
`  <third block of statements>`
`}`
	If `(condition1)` evaluates to `true`, the code in `<first block of statements>` is executed; if `(condition1)` evaluates to `false`, then `(condition2)` is tested; if `(condition2)` evaluates to `true`, the code in `<second block of statements>` is executed; if both `(condition1)` and `(condition2)` evaluate to `false`, then the code in `<third block of statements>` is executed.

Procedures and Procedure Calls	

`PROCEDURE procName( )`
`{`
`  <block of statements>`
`}`
	Defines `procName` as a procedure that takes no arguments. The procedure contains `<block of statements>`. The procedure `procName` can be called using the following notation:
	
	`procName( )`

STRANDS AND STANDARDS
COMPUTER PROGRAMMING ADVANCED

Learning that works for Utah
CTE®

Course Description

This advanced-level course builds upon the foundational skills developed in Computer Programming 1 and 2. Students will deepen their understanding of software engineering principles through hands-on exploration of dynamic data structures, advanced class design, and recursive algorithms grounded in mathematical logic. Emphasis will be placed on real-world applications and problem-solving strategies. Additionally, students will examine the distinguishing features of various programming languages, gaining insight into how language design influences software development.

Intended Grade Level	10-12
Units of Credit	1.0
Core Code	35-02-00-00-040
Concurrent Enrollment Core Code	35-02-00-13-040
Prerequisite	Computer Programming 2 or Teacher Approval
Skill Certification Test Number	840 You can also view the test chart HERE for industry exams.
Skill Certification Cut Score	**72%**
Test Weight	1.0
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Programming & Software Development

Updated: August 2025

STRAND 1

Students will **construct explanations and design solutions** with systems and models (*applications*) while using the advanced skills and concepts developed in Computer Programming 1 and Computer Programming 2.

Standard 1

Demonstrate the ability to develop complex applications.

- Develop complex applications using input, calculations, and output
- Develop complex applications using control structures (loops, if else, select, etc.)
- Develop complex applications in object-oriented programming
- Develop complex applications using data structures
- Develop complex applications using files (sequential files)

Standard 2

Utilize recursive algorithms.

- Analyze and solve recursive functions or methods
- Utilize recursive algorithms to solve a problem
- Identify the base case, recursive case, and action of each recursive function or method
- (Optional) Understand the use of a recursive helper function or method

Standard 3

Create advanced functions and methods.

- Create and use overloaded constructors and methods
- Create and use overloaded operators (C++)

Performance Skills

- Develop advanced applications using input, calculations, output, IF structures, iteration, sub-programs, recursion, arrays, sorting and a database.
- Demonstrate the ability to use random access files in a program.

STRAND 2

Students will use **mathematical and computational thinking skills** to search for and sort *algorithms or patterns.*

Standard 1

Demonstrate the ability to search data structures in programs.

- Develop a binary search
- Compare the efficiency and appropriateness of sequential and binary searches

Standard 2

Demonstrate the ability to sort data structures in programs.

- Sort arrays using iterative sorting algorithms (selection, insertion, bubble)
- Recognize recursive sorting algorithms (merge, quick, heap)
- Recognize sorting data structures using quadratic (n2) and binary (n log n) sorts
- Compare the efficiency of different sorting algorithms

Performance Skills

- Demonstrate the ability to search data structures using binary and hash searches comparing the efficiency between sequential and binary searches.
- Demonstrate the ability to sort data structures using quadratic (n2) and binary (n log n) sorts comparing the efficiency between various sorts using BigO notation.

STRAND 3

Students will **develop and utilize models** to create structure and function in *multidimensional arrays*.

Standard 1

Utilize multidimensional arrays.

- Initialize multidimensional arrays
- Input and output data into and from multidimensional arrays
- Perform operations on multidimensional arrays
- Perform searches on multidimensional arrays

STRAND 4

Students will **plan and carry out investigations** to properly employ *dynamic data structures / abstract data types (ADTs*) that create stability through ordered operations.

Standard 1

Demonstrate the ability to use stacks in programs.

- Declare stack structures
- Initialize stacks
- Check for empty and full stacks
- Push on to and pop off values from stacks
- Develop an application that utilizes stacks

Standard 2

Demonstrate the ability to use queues in programs.

- Declare queue structures
- Check for empty and full queues
- Initialize queues
- Enqueue values on to and dequeue values off of queues
- Develop an application that utilize queues

Performance Skills

Demonstrate the ability to use linked lists, stacks, queues, and binary trees.

STRAND 5

Students will **develop and use models** to implement advanced *objected oriented concepts* to impact a program's structure and function.

Standard 1

Implement object-oriented programs

- Create classes with minimal extraneous relationships (high cohesion and low coupling)
- Demonstrate and use composition and aggregation (HAS-A) relationships
- Demonstrate the use of class variables (static variables)

Standard 2

Implement inheritance in an objected oriented program.

- Utilize class hierarchies (parent-child relationships)
- Demonstrate IS-A relationships
- Override methods. Understand how to call the overriding method from the child
- Demonstrate the protected modifier
- Call a parent class constructor from the child's constructor

Standard 3

Create and use abstract classes.

- Create and implement abstract classes
- Implement interfaces (purely abstract classes)
- Know difference between abstract & interface classes

Standard 4

Implement polymorphism.

- Demonstrate that a parent object variable can hold an instance of a child class
- Determine IS-A relationships via code (e.g. instanceof, typeof, isa)
- Demonstrate typecasting via method calls of inherited objects

Performance Skills

- Develop advanced application projects.
- Develop advanced applications using object-oriented programming.
- Create user-defined inherited classes demonstrating overloading techniques.

STRAND 6

Students will **develop and use** *Unified Modeling Language (UML)* to design system models using object-oriented programs.

Standard 1

Demonstrate the use of a UML in design.

- Create an activity diagram
- Create a class diagram for the class hierarchy of a program
- Create a sequence diagram for a method
- Translate diagrams to code

Strand 7

Students will **obtain and evaluate** the use cases of causes and effects of an *API* in program development

Standard 1

- Students will understand that API's allow programs to talk to each other
- Students will demonstrate the use of an API in the development of a program.
    - Some suggested API's are: pokeAPI.co; restcountries.com; boredAPI.com; API.adviceslip.com; jokeapi.dev; opentdb.com; etc.

STRAND 8

Students will **construct an explanation (problem) and design a solution** by *developing a program* of significant complexity, structure, and function as part of a portfolio.

Standard 1

Create an individual program of significant complexity.

- Create design documentation for the project
- Follow accepted object-oriented programming methodology when writing the code

Standard 2

Compile a portfolio of the individual and group programs developed.

- Include sample design work
- Include sample program source code

Performance Skills

- Create an individual program of significant complexity and size (300-500 lines).
- Compile a portfolio of the individual and group programs developed during the course.
- Participate in a work-based learning experience such as a job shadow, internship, field trip to a software engineering firm or listen to an industry guest speaker and/or compete in a high school programming contest.

Skill Certificate Test Points by Strand

This will be updated after the test has been revised.

Computer Programming 1 - Skills Reference Sheet

Assignment, Display, and Input	
`a = expression`	Evaluates `expression` and then assigns a copy of the result to the variable a.
`DISPLAY(expression)`	Displays the value of `(expression)` in the console window.
`INPUT( )`	Accepts a value from the user and returns the input value.
Arithmetic Operators and Numeric Procedures	

`a + b`
`a - b`
`a * b`
`a / b`
	The arithmetic operators `+, -, *,` and `/` are used to perform arithmetic on `a` and `b`.
	
	For example, `17 / 5` evaluates to `3.4`.
	
	The order of operations used in mathematics applies when evaluating expressions.

`a MODULUS b`
-or-
`a MOD b`
	Evaluates to the remainder when `a` is divided by `b`.
	
	For example, `17 MOD 5` evaluates to `2`.
	
	`MODULUS (MOD)` has the same precedence as the `*` and `/` operators.

Relational and Boolean Operators	
`NOT condition`	Evaluates to `true` if `condition` is `false`; otherwise evaluates to `false`.
`condition1 AND condition2`	Evaluates to `true` if both `condition1` and `condition2` are `true`; otherwise evaluates to `false`.
`condition1 OR condition2`	Evaluates to `true` if `condition1` is `true` or if `condition2` is `true` or if both `condition1` and `condition2` are `true`; otherwise evaluates to `false`.

`FOR(condition)`
`{`
`  <block of statements>`
`}`
	The code in `<block of statements>` is executed a certain number of times.

`WHILE(condition)`
`{`
`  <block of statements>`
`}`
	The code in `<block of statements>` is repeated until the `(condition)` evaluates to `false`.

`IF(condition1)`
`{`
`  <first block of statements>`
`{`
`ELSE IF(condition2)`
`{`
`  <second block of statements>`
`}`
`ELSE`
`{`
`  <third block of statements>`
`}`
	If `(condition1)` evaluates to `true`, the code in `<first block of statements>` is executed; if `(condition1)` evaluates to `false`, then `(condition2)` is tested; if `(condition2)` evaluates to `true`, the code in `<second block of statements>` is executed; if both `(condition1)` and `(condition2)` evaluate to `false`, then the code in `<third block of statements>` is executed.

Procedures and Procedure Calls	

`PROCEDURE procName( )`
`{`
`  <block of statements>`
`}`
	Defines `procName` as a procedure that takes no arguments. The procedure contains `<block of statements>`.
	
	The procedure `procName` can be called using the following notation:
	
	`procName( )`

STRANDS AND STANDARDS
COMPUTER SCIENCE PRINCIPLES

Learning that works for Utah
CTE®

Course Description

Computer Science Principles is a course that offers students a broad overview of the field of computer science. Through the development of algorithms and programs, students will learn to design and evaluate solutions to real-world problems. They will explore how data is created, transformed, and interpreted to support decision-making and innovation. The course also examines the inner workings of computing systems and the impact of computing innovations on society. Students will be encouraged to contribute to a collaborative and ethical computing culture, fostering responsible participation in the digital world.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	35.02.00.00.035
Concurrent Enrollment Core Code	35.02.00.13.035
Prerequisite	None
Skill Certification Test Number	803 You can also view the test chart HERE for industry exams.
Skill Certification Cut Score	**74%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1 or	Information Technology Systems
Endorsement 2 or	Intro to Computer Science
Endorsement 3 or	Programming & Software Development
Endorsement 4	Web Development

*These Strands & Standards are framed after the 2023 AP Computer Science Principles Course. The AP CSP Exam Descriptions can be found HERE.

Updated: August 2025

STRAND 1

Computing and Data

Students will analyze *how computers process and store data,* focusing on **analyzing & interpreting data** to recognize patterns.

Standard 1

Hardware/Software

- Explain the differences between hardware and software and how they relate to input, storage, processing, and output.
- Understand the different file sizes (bit, byte, kilobyte, megabyte, gigabyte, terabyte, and petabyte).
- Discuss the difference between consumer and enterprise (cloud) storage.

Standard 2

Binary Numbers

- Calculate the binary (base 2) equivalent of a positive integer (base 10) and vice versa.
- Compare and order binary numbers.

Standard 3

Data Compression

Students should know the difference between and the use cases of Lossy vs. Lossless.

- Lossy - Compression algorithm in which some of the data from the original file is lost.
- Lossless - Compression algorithm in which file size is reduced without any quality loss.

Performance Skill

Students will differentiate between hardware and software, convert decimal to binary and binary to decimal, and identify when to use lossy vs. lossless compression.

STRAND 2

Creative Development

Collaboration is essential in developing computing innovations. Students will **construct explanations (design solutions)** using *evidence-based reasoning*. By **modeling their innovations as systems** with interacting components, students will better understand and be able to communicate how their designs function.

Standard 1

Collaboration

- Explain how collaboration affects the development of a solution.
- Collaborate in the development of solutions.

Standard 2

Program Function and Purpose

- Identify the problem.
  - Investigate the purpose of a program as it relates to solving the problem.
- Investigate the situation, context, or task.
  - Understand how to break down program specifications into smaller tasks using top-down design and pseudocode.
- Generalize data sources through variables.
  - Understand the uses of different data types (examples: integer, float/double, characters/strings, boolean, etc.)
- Explain how a code segment or program functions.

Standard 3

Identify Different Error Types.

- Identify errors in algorithms and programs, including error discovery through testing.
- Identify different types of errors such as logic, run-time, and syntax errors.

Performance Skill

Students will use problem solving skills and collaboration to explore the purpose of a program and identify errors.

STRAND 3

Algorithms and Programming

Students will use **mathematical, computational thinking** and programming language skills to build *Algorithms* with system structure essential for solving problems and completing tasks.

Standard 1

Variables and Assignments

- Use variables of different data types (examples: integer, float/double, characters/strings, boolean, etc.)
- Convert data types to other data types.
- Determine the value of a variable as a result of an assignment.

Standard 2

Mathematical Expressions

- Implement arithmetic operators (=, +, -, *, /, and MOD) and order of operations (PEMDAS).

Standard 3

Calling and Developing Procedures/Functions/Methods

- Write statements to call Procedures/Functions/Methods
- Determine the result of a Procedures/Functions/Methods

Standard 4

Input / Output

- Receive and store user input.
- Print to console
- Send to output device

Standard 5

Strings

- Evaluate expressions that manipulate strings.
  - String concatenation joins together two or more strings end-to-end to make a new string.

Standard 6

Boolean Expressions

- Write and evaluate expressions using relational operators (==, ≠, >, <, ≥, and ≤).
- Write and evaluate expressions using logical operators (AND, OR, NOT).

Standard 7

Conditionals

- Write conditional statements, such as IF statements and ELSE IF statements.
- Determine the result of conditional statements.

Standard 8

Iteration/Looping

- Write iteration statements, such as for loops and while loops.
- Determine the result of iteration statements.

Performance Skill

Students will use algorithms and programming to solve problems and evaluate the results.

STRAND 4

Computer Systems & Networks

Students will understand, **develop, and model** how *computer systems and networks transfer data* using protocols and the Internet is built on systems and models that use protocols to transfer data.

Standard 1

Computing Systems:

Students will identify a variety of computing systems.

- A computing device is a physical artifact that can run a program. Some examples include computers, tablets, servers, routers, and smart sensors.
- A computing system is a group of computing devices and programs working together for a common purpose.
- A computer network is a type of computing system.

Standard 2

Networks & The Internet:

- Explain how computing devices work together in a network (Network, Path, Routing, Packets, Bandwidth).
  - A computer network is a group of interconnected computing devices capable of sending or receiving data.
  - A path between two computing devices on a computer network (a sender and a receiver) is a sequence of directly connected computing devices that begins at the sender and ends at the receiver.
  - Routing is the process of finding a path from sender to receiver.
  - Bandwidth – The bandwidth of a computer network is the maximum amount of data that can be sent in a fixed amount of time.
  - Packets contain a chunk of data and metadata used for routing the packet between the origin and the destination on the Internet, as well as for data reassembly.
  - Packets may arrive at the destination in order, out of order, or not at all.
- Explain how the Internet works (Fault Tolerance, Protocols, HTTP, HTTPS).
  - The Internet is a computer network consisting of interconnected networks that use standardized, open (nonproprietary) communication protocols.
- Understand the difference between the Internet and the World Wide Web.
  - The World Wide Web is a system of linked pages, programs, and files.
  - HTTP is a protocol used by the World Wide Web.
  - The World Wide Web uses the Internet.

Performance Skill

Students will explain how computer systems and networks, primarily the Internet, work.

STRAND 5

Impact of Computing

Students will **plan and investigate** the *impacts of computing on societal, economical, and cultural issues* to recognize patterns in use. Thus, contributing to a computing culture that is collaborative and ethical.

Standard 1

Beneficial and Harmful Effects

- Explore how an effect of a computing innovation can be both beneficial and harmful.
- Explore advances in computing that have generated and increased creativity in other fields, such as medicine, engineering, communications, and the arts.

Standard 2

Digital Divide and Computing Bias

- Explore issues that contribute to the digital divide (demographics, geographics, socioeconomic, equity, access, influence).
- Explore how bias exists in computing innovations.

Standard 3

Legal and Ethical Concerns

- Explain how the use of computing can raise legal and ethical concerns.
- Understand how ease of access and distribution of digitized information raises intellectual property concerns regarding ownership, value, and use.
- Understand the differences between Copyright, Creative Commons, Public Domain, & Trademark
- Understand how AI impacts the programming field.
- Explain why you should not use AI to write your code as a beginner programmer.
- Understand that AI tools can be helpful for debugging code, but it's important to double-check their suggestions using your own programming knowledge.

Standard 4

Safe Computing

- Describe the risks to privacy from collecting and storing personal data on a computer system.
    - Permanence of online information
    - Students will understand that all their online behavior and digital communications will have long-term ramifications either positive or negative.
- Explain how computing resources can be protected (password strength) and can be misused.
- Explain how unauthorized access to computing resources is gained.
- Understand essential cybersecurity concepts.
    - Malware (adware, trojan horse, virus, ransomware, etc.)
    - Social Engineering (phishing, etc.)

Performance Skills

Students will discuss the benefits and issues of computing.
Students will develop and use safe internet practices.

Skill Certificate Test Points by Strand

This will be updated after the test is revised.

Computer Science Principles Vocabulary

Strand 1 - Computing and Data

Hardware: Physical components of a computer

Software: A program or a collection of programs

Input: The information computers get from users, devices, or other computers

Output: The information computers give to users, devices, or other computers

Storage: Saving information to use in the future

Bit: A single binary digit represented as a 0 or 1.

Byte: 8 bits = 1 byte

Kilobyte: Approximately 1 thousand bytes

Megabyte: Approximately 1 million bytes

Gigabyte: Approximately 1 billion bytes

Terabyte: Approximately 1 trillion bytes

Petabyte: Approximately 1 quadrillion bytes

Processing: An action a computer performs when it receives data

Binary: A base-2 numbering system that computers use to process data

Decimal: A base-10 numbering system that humans typically use to process data

Lossless Compression: Compression algorithm in which file size is reduced without any quality loss.

Lossy Compression: Compression algorithm in which some of the data from the original file is lost.

Strand 2 - Creative Development

Top-Down Design: A problem-solving approach in which you break a large problem into smaller pieces.

Debugging: Finding and fixing problems in an algorithm or program.

Logic Error: A logical mistake in the code that produces incorrect output.

Syntax Error: Errors which are detected and prevent the program from running.

Run Time Error: An error in the code that occurs while the program is running.

Strand 3 - Algorithms and Programming

Algorithm: A finite set of instructions that accomplish a task.

Assignment Operator: Used to change the value of a variable.

Example: score = 10

Variable: A named value within a program.

String: An ordered sequence of characters.

Boolean Value: A data type that is either true or false.

Arithmetic operators: Includes addition, subtraction, multiplication, division, and modulus operators.

Modulus: An operator that returns the remainder of division

Comparison Operators: <, >, ≤, ≥, ==, ≠ indicate a Boolean expression

Logical operator: NOT, AND, and OR, which evaluate to a Boolean value.

Conditional Statement: Decision making based on a Boolean value (IF, ELSE IF, ELSE).

Concatenation: Joins together two or more strings to make a new string.

Iteration/loops: Part of a program that repeats a specified number of times (FOR loop) or until a given condition is met (WHILE loop).

Procedure/Functions/Methods: A named group of programming instructions.

Procedure/Function/Method Call: A command that executes a procedure, function, or method.

Strand 4 – Computer Systems & Networks

Computing Device: A physical artifact that can run a program. (ex: computer, tablet, server, router, etc.)

Computing System: A group of computing devices capable of sending or receiving data.

Network: The hardware that connects computers together to transfer data.

Internet: A global network of networks.

World Wide Web: A collection of information that is accessed via the internet such as web pages or the cloud.

Path: The connections between devices on a network such as ethernet, fiber optics, WiFi, and cellular.

Packet: A chunk of data sent over a network.

Bandwidth: The maximum amount of data that can be sent in a fixed amount of time, usually measured in bits per second.

Router: A type of computer that forwards data across a network

Routing: Routing is the process of finding a path from sender to receiver.

Fault Tolerance: A network's ability to continue operating uninterrupted despite the failure of one or more of its components

Protocol: An agreed-upon set of rules for transmitting data.

HTTP: HyperText Transfer Protocol - the protocol used for transmitting web pages over the Internet

HTTPS: HyperText Transfer Protocol Secure - the protocol used for transmitting encrypted web pages securely over the Internet

HTML: HyperText Markup Language - the language used to create a webpage.

HTML Tags: Code that modifies a webpage, such as <!DOCTYPE html>, <html>, <head>,<title>, <body>, <h1 - h6>, <p>, <br>, etc.

Strand 5 - Impact of Computing

Digital Divide: Differing access to computing devices and the Internet, based on socioeconomic, geographic, or demographic characteristics.

Data bias: An error in which certain elements of a data set do not accurately reflect the full population or phenomenon.

Malware: Short for "malicious software." Malware is software designed to cause damage.

Adware: Malware that automatically displays or downloads advertisements.

Trojan Horse: Malware which appears harmless and pretends to do something useful.

Virus: Malware that can copy itself and gain access to a computer in an unauthorized way

Ransomware: Malware that blocks access to a computer system until a "ransom" is paid.

Social Engineering: Manipulating people into performing certain actions or giving up confidential information.

Phishing: A type of social engineering attack that attempts to trick a user into providing personal information.

Copyright: An exclusive right that is applied to tangible works

Creative Commons: Works which copyright is reserved but can be copied

Public Domain: Works that are not protected by copyright

Trademark: Symbols or words that a company has exclusive rights to use

Computer Science Principles Skills Reference Sheet

Assignment, Display, and Input	
`a = expression`	Evaluates `expression` and then assigns a copy of the result to the variable a.
`DISPLAY(expression)`	Displays the value of `(expression)` in the console window.
`INPUT( )`	Accepts a value from the user and returns the input value.
Arithmetic Operators and Numeric Procedures	

`a + b`
`a - b`
`a * b`
`a / b`
	The arithmetic operators `+, -, *,` and `/` are used to perform arithmetic on `a` and `b`.
	
	For example, `17 / 5` evaluates to `3.4`.
	
	The order of operations used in mathematics applies when evaluating expressions.

`a MODULUS b`
-or-
`a MOD b`
	Evaluates to the remainder when `a` is divided by `b`.
	
	For example, `17 MOD 5` evaluates to `2`.
	
	`MODULUS (MOD)` has the same precedence as the `*` and `/` operators.

Relational and Boolean Operators	
`NOT condition`	Evaluates to `true` if `condition` is `false`; otherwise evaluates to `false`.
`condition1 AND condition2`	Evaluates to `true` if both `condition1` and `condition2` are `true`; otherwise evaluates to `false`.
`condition1 OR condition2`	Evaluates to `true` if `condition1` is `true` or if `condition2` is `true` or if both `condition1` and `condition2` are `true`; otherwise evaluates to `false`.

`FOR(condition)`
`{`
`  <block of statements>`
`}`
	The code in `<block of statements>` is executed a certain number of times.

WHILE(condition)
{
  <block of statements>
}
	The code in <block of statements> is repeated until the (condition) evaluates to false.

IF(condition1)
{
 <first block of statements>
{
ELSE IF(condition2)
{
  <second block of statements>
}
ELSE
{
  <third block of statements>
}
	If (condition1) evaluates to true, the code in <first block of statements> is executed; if (condition1) evaluates to false, then (condition2) is tested; if (condition2) evaluates to true, the code in <second block of statements> is executed; if both (condition1) and (condition2) evaluate to false, then the code in <third block of statements> is executed.

Procedures and Procedure Calls	

PROCEDURE procName( )
{
  <block of statements>
}
	Defines procName as a procedure that takes no arguments. The procedure contains <block of statements>.
	
	The procedure procName can be called using the following notation:
	
	procName( )

STRANDS AND STANDARDS
EXPLORING COMPUTER SCIENCE

Learning that works for Utah
CTE®

Course Description

Exploring Computer Science introduces students to the diverse and dynamic field of computer science through engaging, accessible topics. Students will learn to design and evaluate solutions by developing algorithms and writing programs, while also exploring how data is created, transformed, and interpreted. The course emphasizes computational thinking and problem-solving in contexts that are meaningful to students' lives. Learners will investigate how computing systems and innovations function, and analyze their societal impacts. Topics include artificial intelligence, web development, programming, and physical computing, all within a collaborative and ethical computing culture.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	35.02.00.00.007
Concurrent Enrollment Core Code	35.02.00.13.007
Prerequisite	None
Skill Certification Test Number	802 You can also view the test chart HERE for industry exams.
Skill Certification Cut Score	**74%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1 or	Cybersecurity
Endorsement 2 or	Information Technology Systems
Endorsement 3 or	Intro to Computer Science
Endorsement 4 or	Multimedia
Endorsement 5 or	Programming & Software Development
Endorsement 6	Web Development

Updated: August 2025

STRAND 1

Computer Science Practices

Students will employ the following practices throughout the course. They provide a framework and serve as helpful reminders of the high-level skills and dispositions computer scientists should be continually developing.

Standard 1

Critical Thinking

- Use the structured problem-solving process to help address new problems
- View challenges as solvable
- Decompose or break down larger problems into smaller components

Standard 2

Persistence

- Expect and value mistakes as a natural and productive part of problem solving
- Continue working with new ideas and consider multiple possible approaches
- Iterate and continue to improve partial solutions

Standard 3

Creativity

- Incorporate personal interests and ideas into activities and projects
- Experiment with new ideas and consider multiple possible approaches
- Extend or build upon the ideas and projects of others

Standard 4

Collaboration

- Work with others to develop solutions that incorporate all contributors
- Mediate disagreements and help teammates agree on a common solution
- Actively contribute to the success of group projects

Standard 5

Communication

- Structure work so that it can be easily understood by others
- Consider the perspective and background of your audience when presenting work
- Provide and accept constructive feedback in order to improve work

STRAND 2

Problem Solving with Computers

Students will learn how computers input, output, store, and process information. Students will gain the importance of solving problems, and/or automating tasks with the aid of computers, as well as a basic understanding of the algorithms computers use.

Standard 1

Students will understand computer hardware and the tasks they perform:

- Students will identify the required functions for a device to be classified as a computer (receives input, processing; output; storage)
  - Analyze the characteristics of hardware and software components including processors, RAM, ROM, hard drive, input and output devices, and operating system.
  - Understand the relationship between bits and bytes.
  - Compare and convert between the following sizes: kilobyte, megabyte, gigabyte, terabyte and petabyte.
  - Discuss the difference between consumer and enterprise (cloud) storage.
  - Discuss the speed of the computer (gigahertz).
- Students will identify examples of tasks that can and cannot be accomplished with a computer.

Standard 2

Students will describe changes technology has made on communication, privacy, and social interactions.

- Impacts of technology on society from the following perspectives: social, economic, political, legal, ethical, and moral issues
- Permanence of online information
- Consider issues around privacy and collection of data
- Students will understand that all their online behavior and digital communications will have long-term ramifications either positive or negative.
- Online safety

Standard 3

Students will discuss how and why binary is used to represent data in a computer.

- Describe how binary digits (bits) are stored in different media
- Understand the binary system or pattern for counting up to 8 digits
- Convert numbers between 0 and 128 from decimal to binary and vice versa.
- Describe how real-world phenomena such as numbers, characters (ASCII), or images (RGB) are digitized and represented in a computer.

Standard 4

Students will understand different algorithms used in problem solving.

- Solve a problem through an iterative process.
  1. Define - Understand the Problem
  2. Prepare - Plan the Solution (design via pseudocode/flowcharts/storyboards)
  3. Try - Carry out the Plan (Code)
  4. Reflect - Review and Discuss your Solution (Testing / Feedback)
  5. Repeat - Reiterate through the steps until the problem is solved
- Explain when a binary search would be more efficient than a linear search (put into CSP)

Standard 5

Students will gain knowledge and skills while considering the social, moral, and ethical impacts of Artificial Intelligence (AI) systems and usage.

- Students will explain the idea of intelligence specifically as it relates to computers.
- Students will explain what it means for a machine to learn
- Students will identify the AI being used, such as image recognition, speech recognition, translation, creation of artifacts (media, print, sound, etc.), etc.
- Students will train and test an existing AI system (machine learning).
- Students will understand the difference between predictive and generative AI
- Students will explore and explain the social and ethical impacts of AI (human and algorithmic bias, worker obsolescence through automation, user interface improvements, human/machine augmentation, etc.)
    - Appropriate use of AI
    - Effective prompting
- Students will gain an understanding of how AI is changing different sectors such as medicine, agriculture, manufacturing, etc.

STRAND 3

Web Development

Students will learn social responsibility and ethics with regard to web development and how to use the basic building blocks of the World Wide Web: HTML5 and Cascading Style Sheets (CSS). Students will follow the steps to create a website by planning, designing, and coding a personal website.

Standard 1

Social Responsibility of Website Development

- Students will understand ethical behavior as it relates to an AUP, Intellectual Property, Netiquette, Respecting Privacy, Anti-Spamming Laws, etc.
- Students will demonstrate knowledge of standard copyright rules.
  - Understand copyright for original creations.
  - Understand the creative commons license
  - Understand when to obtain permission for non-original work.
- Students will identify the use and purpose of acceptable use policy (AUP).
  - Comply with the school's AUP

Standard 2

Design Process

- Students will understand the need to know the purpose of website design in relationship to the intended audience and client needs.
  - Students will plan a website design using storyboards, wireframes, etc.

Standard 3

HTML

- Students will understand that the HTML programming language is used to create all websites on the internet and acts as the structure for a website.
  - Students will code the foundation for a basic webpage including the element tags DOCTYPE, html, head, title, and body.
  - Students will create pages with tags and attributes at the inline level. (DOCTYPE, title, head, body, h1 – h6, p, etc.)
  - Students will create web pages with text formatting, links, images, and lists.

Standard 4

CSS (Cascading Style Sheets)

- Students will understand that CSS (Cascading Style Sheets) are used to customize the style or looks of a website.
  - Students will apply CSS to a website.
    - Apply CSS to a web site using best practices (external CSS).
  - Students will format web pages using CSS
    - Modify background properties such as color and image.
    - Modify font properties such as font-family, size, and color.
    - Modify border properties such as width, style, and color.
    - Implement tags and classes to modify an HTML element.

Standard 5

Careers in Web Development

- Students will explore various careers in Web Development including front end developer, back end developer, full stack developer, and UX/UI designer.

STRAND 4

Programming and Algorithms

Students will understand that an algorithm is a sequence of steps designed to accomplish a specific task. Algorithms are then translated into programs, or code, to provide instructions for computing devices.

Standard 1

Program Design

- Students will identify how planning strategies (such as flowcharts, storyboards, prototypes or pseudocode) are used when creating a program.

Standard 2

Algorithms

- Define an algorithm as a set of clearly defined, logical steps to solve a problem.
  - Students will describe the steps needed to efficiently solve a non-computing problem using a pseudocode algorithm
  - Students will examine and formulate algorithms that solve specific problems.

Standard 3

Input/Output

- Students will recognize a variety of different user input sources such as text input, sensors, mouse response, movement, or event. Students will recognize a variety of different outputs such as sounds, light, vibrations, movement, text and/or graphics.

Standard 4

Variables

- Students will understand that variables are named locations in memory used to store data.
- Students will be able to identify variables and when they should be used in code.

Standard 5

Conditionals

- Students will understand that programs use conditionals to perform different computations or actions based on whether a condition is true or false (booleans).

Standard 6

Loops

- Students will understand that programs use loops (iteration) to be more efficient and avoid code duplication.
  - For loop – know the number of times you are going to iterate
  - While loop – iterate until a boolean condition is no longer true

Standard 7

Operators

- Students will understand that programs use mathematical symbols (+, -, *, /, >, <, ==, AND, OR) in a program to perform specific operations (mathematical, relational, or logical) and produce a single result.

Standard 8

Functions

- Students will understand that a function is a named block of code that performs a specific task. Functions encourage efficiency, reusability, and readability.

Standard 9

Debugging

- Students will understand that debugging is finding and removing errors from a program so it can operate as intended. Strategies students might learn for debugging could include:
  - Guess and Check
  - Deactivating sections to identify problematic code
  - Looking for typos, missing tags, or incorrect syntax
  - Making the problem smaller - identifying important points (changing variable values, getting input, etc.)
  - Asking a friend or team member for help
  - Printing, watching, or changing variable values while the program runs
  - Using a debugging tool
  - Thinking about when the code last worked and what has been added since then

Standard 10

Physical Computing

- Students will demonstrate an understanding of the relationship between hardware and software.
  - Students will define and explain an algorithm for a physical computing device. (sequence of instructions processed by the device.)
  - Students will create a prototype of a physical computing device that uses algorithms to solve a computational problem.
  - Students will create a physical project or program a physical device
    - Students will illustrate ways the project or physical device implements logic, input, and output through hardware components (sensors, buttons, switches, etc.)
    - Students will systematically identify and fix problems with the project or physical device.

Standard 11

Careers in Programming

- Students will explore various careers in programming such as Software Engineer, Video Game Developer, Mobile App Developer, and Web Developer.

Performance Skills

- Students will design algorithms and create programming solutions to a variety of computational problems using a block or text programming language.
- Students will develop a program or programs that:
  - makes a decision based on data or user input (conditionals).
  - accepts user and/or sensor input and stores the result in a variable.
  - uses variables that represent different data types.
  - uses structures that repeat blocks/lines of code (loops).
  - uses operators.
  - uses functions.
- Students will analyze, test, improve and debug computer programs.
- Students will design and create a physical project or program a physical device and debug the project or device

Skill Certification Test Points by Strand

This will be updated after the skill certification is revised.

Exploring Computer Science Vocabulary

Strand 2: Problem Solving with Computers

Algorithm: A list of steps to finish a task.

ASCII: A common numeric representation of a text character (American Standard Code for Information Interchange).

Artificial Intelligence (AI): A technology that mimics human intelligence, performing tasks such as understanding language, recognizing patterns, and making decisions.

Bias: Prejudice in favor of or against one thing, person, or group compared with another.

Binary: A way of representing information using only two options.

Binary Search: Compares the target value to the middle element of the array. If they are not equal, the half in which the target cannot lie is eliminated and the search continues on the remaining half, again taking the middle element to compare to the target value and repeating this until the target value is found.

Bit: The single unit of information in a computer, typically represented as a 0 or a 1.

Byte: The most common fundamental unit of digital data (ex: Kilobyte, Megabyte, etc.). A single byte is 8 bits worth of data.

Decimal: A term that describes the base-10 number system, probably the most commonly used number system. The decimal number system consists of ten single-digit numbers: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Digital Footprint: The collected information about an individual across multiple websites on the Internet.

Gigabyte: A unit of information equal to 1024 megabytes or 2^30 (1,073,741,824) bytes.

Hertz/Gigahertz: A unit measuring the waves or frequencies of electric changes each second, such as the clock rate of a computer CPU.

Input: The action of entering data into your computer.

Kilobyte: The smallest unit of measurement greater than a byte; a kilobyte is 103 or 1,000 bytes.

Linear Search: A process in which a sequential search is made over all items one by one. Every item is checked and if a match is found then that particular item is returned, otherwise the search continues till the end of the data collection.

Megabyte: Equal to 1,000 kilobytes; a megabyte is 106 or 1,000,000 bytes.

Operating system: Software that communicates with the hardware and allows other programs to run. It is comprised of system software, or the fundamental files your computer needs to boot up and function. Every desktop computer, tablet, and smartphone includes an operating system that provides basic functionality for the device; common desktop operating systems include Windows, OS X, and Linux.

Output: What the computer produces based on user input. This includes data produced at a software level, such as the result of a calculation, or at a physical level, such as a printed document. A basic example of software output is a calculator program that produces the result of a mathematical operation. A more complex example is the results produced by a search engine, which compares keywords to millions of pages in its web page index.

Pixel: In short for "Picture Element". These small little dots are what make up the image on computer displays, whether they are flat-screen (LCD) or tube (CRT) monitors. The screen is divided up into a matrix of thousands of even millions of pixels. Typically, you cannot see the individual pixels because the are so small. This is a good thing, because most people prefer to look at smooth, clear images rather than blocky, "pixelated" ones.

Privacy: A branch of data security concerned with the proper handling of data – consent, notice, and regulatory obligations. More specifically, practical data privacy concerns often revolve around:

- Whether or how data is shared with third parties
- How data is legally collected or stored.
- Regulatory restrictions such as GDPR, HIPAA, GLBA, or CCPA.

Processor: A small chip that resides in computers and other electronic devices. Its basic job is to receive input and provide the appropriate output.

Processing: A series of operations on data, especially by a computer, to retrieve, transform, or classify information.

RAM: "Random Access Memory" is common hardware component found in electronic devised, including desktop computers, laptops, tables, and smartphones. The amount of RAM in a device determines how much memory the operating system and open applications can use. When a device has sufficient RAM, several programs can run simultaneously without any slowdown. When a device uses close to 100% of the available RAM, memory must be swapped between applications, which may cause a noticeable slowdown.

RGB: A numeric representation of a color based on red, green, and blue values.

ROM: "Read-Only Memory" is memory containing hardwired instructions that the computer uses when it boots up before the system software loads. In PCs the instructions are read from a small program in the ROM, called the BIOS (Basic Input/Output System).

Sorting Algorithm: A sorting algorithm is an algorithm that puts elements of a list in a certain order.

Terabyte: Is equal to 1,024 gigabytes or 1,000,000 megabytes

Turning Test: A test for intelligence in a computer, requiring that a human being should be unable to distinguish the machine from another human being by using the replies to questions put to both.

Strand 3 – Web Development

Back End Web Developer: Person who uses scripting languages such as PHP and other databases to design how a website works.

Copyright: The exclusive legal right to print, publish, perform, film, or record literary, artistic, or musical material, and to authorize others to do the same.

Creative Commons: A set of various licenses that allow people to share their copyrighted work to be copied, edited, built upon, etc. while retaining the copyright to the original work (often used attributively).

CSS (Cascading Style Sheets): A language used to describe how HTML elements should be styled.

CSS Class: An identifier that allows multiple elements in an HTML document to be styled in the same way.

CSS Selector: The part of a CSS ruleset that defines which HTML elements should be applied to the style.

Digital Footprint: A trial of data you create while using the Internet. It includes the website you visit, emails you send, and information you submit to online services.

Front End Web Developer: Person who uses HTML, CSS, and image editing software to design that front end or public side of the website.

Full Stack Development : Developer who is comfortable working with both back-end and front-end technologies.

Headings: HTML tags that are used to indicate sections of a page. The name of each heading indicates its level in a hierarchy.

HTML: Hypertext Markup Language, a language used to create web pages.

HTML Element: A piece of a website, marked by a start tag and often closed with an end tag.

HTML Tag: The special set of characters that indicates the start and end of an HTML element and that element's type.

HTTP: Hypertext Transfer Protocol, the set of rules for transferring files on the World Wide Web.

Hyperlink: A word, phrase, or image that you can click on to jump to a new document or a new section within the current document. Text hyperlinks are often blue and underlined, but do not have to be. When you click it, a new page or place in the current page will open.

Netiquette: The rules of etiquette that apply when communicating over computer networks, especially the Internet.

Web Browser: An application used to access and view websites. Common web browsers include Microsoft Internet Explorer, Google Chrome, Mozilla Firefox, and Apple Safari.

Website Content: The text and images on a website.

Website Structure: How the content of a website is organized.

UX (User Experience) Designer: Designers are primarily concerned with how the product feels.

UI (User Interface) Designer: Designers are particular about how the product is laid out

Strand 4 – Programming & Algorithms

Boolean Logic: Deals with the basic operations of truth values: AND, OR, NOT, and combinations thereof.

Conditional Statement: A set of rules performed is a certain condition is met. It is sometimes referred to as an If-Then statement, because IF a condition is met, THEN an action is performed.

Debugging: A systematic approach to problem solving that is often used to find and resolve a problem, error, or fault within software or a computer system.

Decompose: Break a problem down into smaller pieces.

Flowchart: A graphic representation of an algorithm, a step-by-step approach to solving a task.

Functions: "Self-contained" modules of code that accomplish a specific task. Functions usually "take in" data, process it, and "return" a result. Once a function is written, it can be used repeatedly. Functions can be "called" from the inside of other functions.

Iterate: The repetition of a function or process in a computer program. Iterations of functions are common in computer programming since they allow multiple blocks of data to be processed in sequence. This is typically done using a "while loop" or "for loop". These loops will repeat a process until a certain number or case is reached.

Loop: A programing structure that repeats a sequence of instructions as long as a specific condition is true.

Operators: A symbol that usually represents an action or process. These symbols were adapted from mathematics and logic. An operator is capable of manipulating a certain value or operand. Operators are the backbone of any program, and they are used for everything from very simple functions like counting to complex algorithms like security encryption.

Physical Computing: Building interactive physical systems by the use of software and hardware that can sense and respond to the analog world.

Pseudocode: A detailed yet readable description of what a computer program or algorithm must do, expressed in a formally styled natural language rather than in a programming language.

Prototype: An early approximation of a final product or information system, often built for demonstration purposes.

Sensors: A device that detects and responds to some type of input from the physical environment. Sensors send data to a microprocessor (computer).

Storyboard: A graphic organizer that provides the viewer with a high-level view of a project. In software development, a storyboard can help developers quickly get a sense of what work still needs to be completed.

User: A person for whom a hardware or software product is designed (as distinguished from the developers).

Variable: A placeholder for a piece of information that can change.
Note: This definition differs from that used in math.

STRANDS AND STANDARDS

INTRODUCTION TO INFORMATION TECHNOLOGY & CYBERSECURITY (Intro to IT & Cyber)

Learning that works for Utah
CTE®

Course Description

The Intro to Information Technology & Cybersecurity (Intro to IT & Cyber) is designed for students interested in exploring careers in the field of Information Technology. Students will be introduced to various domains within the field of IT to help identify their areas of interest. Through hands-on assignments and projects, students will gain foundational knowledge in IT careers, hardware and operating systems, communications and networking, cybersecurity, software development, databases, and emerging technologies.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	35.02.00.00.005
Concurrent Enrollment Core Code	35.02.00.13.005
Prerequisite	None
Skill Certification Test Number	801 You can also view the test chart HERE for industry exams
Skill Certification Cut Score	**73%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Cybersecurity
Endorsement 2	Information Technology Systems
Endorsement 3	Programming & Software Development
Endorsement 4	Technology
Endorsement 5	Web Development

Updated: August 2025

STRAND 1

Foundational IT Concepts and Device Components

Students will understand the basic components of computers, IT terminology, and troubleshooting methodologies.

Standard 1

Students are introduced to the importance of ethics and ethical behavior.

- Understand and follow an Acceptable Use Policy (AUP)
- Explain the difference between legal and ethical
- Explain how some online behaviors can be harmful personally and to a business (Pornography, social networking, gaming, pirating software, illegal hacking)
- Follow copyright and fair use guidelines

Standard 2

Understand the importance of information privacy and security.

- Viruses, spoofing, phishing, cookies, spam
- Explain different kinds of anti-virus software and how they work

Standard 3

Recognize and Explain Basic Computer Components.

- Recognize and explain functions of basic computer components: RAM, CPU/APU (x86 [32-bit and 64-bit], ARM), Graphics Card, Physical Storage, Motherboard
- Explain the basics of computing: input, processing, output, storage

Standard 4

Identify Notational Systems and Units of Measure.

- Identify notational systems: binary, hexadecimal, decimal, octal
- Convert numbers between 0 to 128 from decimal to binary and vice-versa
- Compare standard units of measure:
  - Storage: Bit, Byte, KB, MB, GB, TB, PB
  - Processing Speed: MHz, GHz
  - Throughput: bps, Kbps, Mbps, Gbps, Tbps

Standard 5

Compare and Understand Storage Types.

- Compare storage types: volatile vs. non-volatile, optical, local storage (external flash, RAM, ROM, storage drive, magnetic disks/HDD, SSD, NVMe), and local network storage (NAS, file server)

Standard 6

Learn and demonstrate use of the Troubleshooting Methodology throughout the course.

- Methodology:
  - Identify the problem
  - Establish a theory of probable cause
  - Test the theory to determine the cause
  - Establish a plan of action and implement the solution
  - Verify full system functionality and implement preventive measures
  - Document findings, actions, and outcomes
- Gather data and determine when to escalate issues

Performance Skills

- Define and demonstrate ethical behavior.
- Demonstrated proper handling techniques of hardware components.
- Disassemble and rebuild a computer system either individually, in teams, or with the instructor.

STRAND 2

Operating Systems and Software Management

Students will manage operating systems, applications, and general software.

Standard 1

OS Installation and Core Management (This can be done as a demonstration, a simulation, etc.).

- Install and configure Windows, including user accounts, basic desktop settings (e.g., Start menu, display, taskbar), and accessibility options
- Manage OS and device driver updates
- Explain the purpose of the Windows Registry
- Identify core OS components, including file systems, utilities (such as services and drivers), interfaces (such as GUI and command line), and permissions

Standard 2

Application and Software Usage.

- Manage application installations, including permissions and removal
- Understand the purpose and proper use of productivity, collaboration, web browsing, and remote support software
- Configure web browser features, including private browsing, extensions/add ons, cache clearing, and password management

Standard 3

Basic System Troubleshooting.

- Utilize basic Windows troubleshooting tools: Event Viewer, Task Manager, Defragment/Optimize Drive
- Troubleshoot OS and application issues: reset/roll back OS, advanced startup (System repair), Safe Mode features, identify app compatibility, resolve Store app installation, reinstall/repair desktop apps, troubleshoot services, use Task Manager (turn off startup app, end task, manage service)
- Manage and troubleshoot hardware/peripherals: utilize hardware troubleshooting methods (connections, ports, power), update/roll back drivers, uninstall/reinstall a device to reconfigure drivers, and understand the purpose and capabilities of Device Manager/Disk Management

Standard 4

Learn about careers and educational opportunities in Systems Administration and Support.

- Explore certification options in Systems Administration & IT Support
- Explore education and work experience that can lead to System Administration & IT Support careers
- Identify Systems Administration career opportunities (Systems Administrator, IT Support, Cloud Administrator, DevOps Engineer, etc). and the roles of each

Performance Skills

- Install, configure, and manage operating systems and software applications by adjusting system settings, managing updates and drivers, and applying best practices for software use and browser configuration.
- Troubleshoot system and application issues using built-in tools and methods, and demonstrate the ability to manage hardware and peripheral devices through effective diagnostic and repair techniques.

STRAND 3

Device Connectivity and Peripherals

Students will understand various peripheral connection types and how to configure display properties and install peripheral devices.

Standard 1

Understand Peripheral Connections.

- Compare peripheral connection types: HDMI (full, mini, micro), DisplayPort (full, mini), DVI family, VGA, USB (A, mini-A, micro-A, B, mini-B, micro-B, C, 3.0), Thunderbolt, S/PDIF Optical, and aux audio cable, as well as conversion types
- Compare input/output device interfaces:
  - Networking (Wired): Ethernet (RJ45), Fiber (SFP)
  - Networking (Wireless): Bluetooth, NFC, 802.11X
  - Peripheral Devices: USB (A/B/C), Thunderbolt, Bluetooth, RF, Lightning
  - Display Ports: VGA, DVI, HDMI, DisplayPort, USB-C

Standard 2

Configure Peripherals and Displays.

- Configure projection/display properties, including wireless casting, orientation, duplication vs. extension, resolution, and aspect ratio
- Install and configure standard peripheral devices, including printers, scanners, keyboards, mice, webcams, external drives, speakers/headsets, and displays (such as Smart TVs, projectors, and monitors)
- Understand the various peripheral installation types, including plug-and-play versus driver installation, additional steps required, IP-based peripherals, and web-based configuration steps

Performance Skills

- Identify and compare various peripheral connection types and device interfaces—including display, audio, and networking ports—and explain their functions and compatibility across different technologies.
- Install and configure peripheral devices and display systems by applying appropriate setup procedures, adjusting projection properties, and troubleshooting installation types such as plug-and-play, driver-based, and IP/web-based configurations.

STRAND 4

Networks & Communication

Students will understand network connections, services, and basic network configuration.

Standard 1

Compare common network devices and purposes.

- Network devices such as smartphones, tablets, e-readers, laptops, workstations, servers, gaming consoles, VR/AR systems, etc.
- Internet of Things (IoT) devices such as home appliances, automation, thermostats, etc.
- Network hardware such as modems, routers, switches, access points, firewalls, network interface cards (NIC)
- Explore configuration of these various devices

Standard 2

Explore and understand basic networking concepts and services.

- Understand and describe how the Internet is a network system
- Compare common internet service types: fiber optic, cable, DSL, wireless (RF, satellite, cellular)
- Identify & describe network medium types (twisted pair, unshielded twisted pair (UTP), CAT 6, wireless, Bluetooth, fiber optic, cellular LTE, satellites)
- Describe how packets are used to send and receive data
- Understand that network protocols are a set of rules
- Identify common network protocols (TCP/IP, FTP, HTTP, HTTPS, etc.)
- Identify and describe common networking models: client/server, peer-to-peer, star, mesh, etc.
- Examine the uses of a LAN (local area network), WAN (wide area network), and MAN (metropolitan area network)
- Troubleshoot wired and wireless network connections using tools like ipconfig and ping

Standard 3

Explore and understand wireless technologies

- Compare and contrast wired, wireless, and cell networks
- Explain basic small wireless network capabilities
- Wireless access points, bridges, extenders and Wireless LAN Controllers
- 802.11 standards, including n/ac/ax
- Speed & interference/attenuation considerations, including band options & ramifications (2.4GHz, 5GHz, 6GHz)

Standard 4

Compare and understand Virtualization and Cloud technologies.

- Hypervisor vs Virtual Machine (Guest OS)
- Cloud Services: SaaS, PaaS, IaaS
- Deployment models: cloud, hybrid, and on-premises
- Utilize a local or online sandbox environment like cyber.org to explore virtualization

Standard 5

Learn about careers and educational options in Networking.

- Explore certification options in Networking
- Explore education and work experience that can lead to IT Network careers
- Identify Networking career opportunities (Network Administration, Network Engineer, Network Architect, VoIP Engineer, etc.) and the roles of each.

Performance Skills

- Demonstrate an understanding of network systems by identifying and configuring various devices and technologies—including hardware, wireless standards, and cloud services—and explaining their roles in modern communication networks.
- Apply foundational networking concepts to troubleshoot connections, compare service types and protocols, and explore career pathways in IT networking through hands-on activities and research-based presentations.

STRAND 5

Security

Students will be introduced to essential cybersecurity concepts, including threats, defenses, and responsible digital practices.

Standard 1

Understand Core Security & Cyberspace.

- Explain the Confidentiality, Integrity, and Availability (CIA) Triad
- Describe physical security deterrents controls like fencing, cameras, keycard systems, biometric scanners, etc.
- Describe key security threats like malware (viruses, ransomware), social engineering (phishing) and physical attacks
- Recognize the global nature of the Internet and its associated data protection challenges
- Understand the role of ethics in cybersecurity

Standard 2

Manage Access & Authentication.

- Describe user authentication methods, including multifactor authentication and biometrics
- Explain password best practices (complexity, length, history)
- Understand permissions and the principle of least privilege
- Manage User Account Control (UAC) settings

Standard 3

Secure Devices, Networks, & Data.

- Understand the concepts in “Computational Thinking”
- Implement anti-malware and configure firewall settings
- Secure wireless networks by changing SSID and passwords, and understanding encryption types (WPA, WPA2, WPA3)
- Identify uses of encryption for data at rest and in transit (HTTPS, VPN)
- Explain data backup concepts and privacy considerations (PII, GDPR)
- Understand safe browsing practices (certificates)

Standard 4

Troubleshoot & Respond to Incidents.

- Apply a basic troubleshooting methodology (identify the problem, establish a theory, test theory, implement solution, verify system functionality, document results)
- Describe how to respond to malware and social engineering attacks
- Participate in a cybersecurity activity such as Capture the Flag challenges, table top attack scenario, or other online simulation

Standard 5

Learn about careers and educational options in Cybersecurity.

- Explore certification options in Cybersecurity
- Explore education and work experience that can lead to Cybersecurity careers
- Identify Cybersecurity career opportunities (Network Security, Security Engineer, Forensic Analyst, Penetration Tester, etc.) and the roles of each

Performance Skills

- Apply cybersecurity principles to identify threats, manage authentication, secure systems, and respond to incidents using tools and techniques such as firewalls, encryption, and troubleshooting methodologies.
- Demonstrate responsible digital practices by evaluating ethical considerations, understanding global data protection challenges, and exploring career pathways and certifications in cybersecurity.

STRAND 6

Software and Applications

Students will understand software development, databases, and AI concepts.

Standard 1

Understand the evolution and use of varied software development languages.

- Describe the difference between for interpreted, compiled, markup, scripting, and assembly languages
- Identify basic kinds of programming (modular, procedure, & object-oriented programming (OOP))

Standard 2

Understand the basic structures and controls used in programming

- Understand and use different data types, including char, strings, numbers (integers, floats), and Boolean
- Understand the use of variables, constants, arrays, functions, loops, and objects
- Write a basic program utilizing pseudocode and a flowchart

Standard 3

Create a basic application using a programming language (MIT Scratch, C#, Python, AppLab, PencilCode, JavaScript, TouchDevelop, Java, Swift, Snap!, etc.).

- Understand and use good principles of design for the user experience (UX) and the user interface (UI)
- Understand and use programming conventions (indentation, capitalization, etc.)
- Understand and use: inputs, outputs, variables, data types, operators, Booleans, loops, functions, comments, etc.
- Publish or share your project with others

Standard 4

Understand database concepts to create and use a database.

- Identify several databases that students may be a part of (school SIS (grading system), bank, SSN, IRS, state driver's license)
- Identify several databases that can be accessed on the Internet (search engines, white pages, Facebook, real estate listings)
- Understand the value of databases, including monetization, reporting, and data-driven decisions
- Understand basic vocabulary associated with a database (relational vs. non-relational, flat-file, table, rows, record, field, query, select, sort, report, primary/foreign keys)
- Create a flat file database, enter, edit, and delete records

Standard 5

Understand the basics of Artificial Intelligence

- Understand and describe the differences between the types of Artificial Intelligence (AI): chatbots, assistants, and generative AI
- Discuss the future of AI, including its impact on society, careers, and ethical concerns
- Discuss prompting and how your prompt will affect your outcome

Standard 6

Learn about careers and educational options in Software and Application Development.

- Explore certification options in Software and Application Development.
- Explore education and work experience that can lead to Software and Application Development careers.
- Identify Software and Application Development career opportunities (Software Developer, Database Administrator, AI Product Manager, etc.) and the roles of each.

Performance Skills

- Design and develop basic software applications by applying programming principles, using appropriate languages and tools, and incorporating user interface and experiencing best practices.
- Demonstrate a foundational understanding of databases and artificial intelligence by creating and interacting with data systems and evaluating the role of AI in technology and society.

Skill Certification Test Points by Strand

Will be updated after the skills exam revision is completed.

Healthcare and Human Services

Health Science		
Course Code	**Course**	**Changes**
36.01.00.00.001	Health Science Capstone	Minor changes to verbiage to be more consistent with industry.
36.01.00.00.040	Exercise Science/Sports Medicine	Edits made to improve clarity and readability. Updated some techniques/processes to meet current industry standards. Added a new performance skill. Added vocabulary list with definitions.
36.01.00.00.110	Medical Anatomy & Physiology	Added SEEd standards to strands. Edits made to improve clarity and readability. Added vocabulary list with definitions.
36.01.00.00.115	Medical Anatomy & Physiology, Advanced	Added SEEd standards to strands. Edits made to improve clarity and readability. Added cranial nerves. Removed types of muscle contraction. Expanded tooth anatomy. Added vocabulary list with definitions.
36.01.00.00.150	Medical Math	Improved the course description. Edits made to ensure logical flow and readability. Added performance skills. Added vocabulary list with definitions.
36.01.00.00.175	Medical Terminology	Added word/definition lists to each strand. Added new performance skills.

STRANDS AND STANDARDS
HEALTH SCIENCE CAPSTONE

Course Description

This course is designed for advanced health science students, offering them the opportunity to apply their knowledge and skills in practical settings, preparing them for professional experiences in healthcare fields. The course encourages students to think analytically, logically, and creatively to integrate experience and knowledge into practical situations.

Intended Grade Level	12
Units of Credit	0.5-1.0
Core Code	36.01.00.00.001
Concurrent Enrollment Core Code	36.01.00.13.001
Prerequisite	Medical Anatomy & Physiology
Skill Certification Test Number	971 - USBE Project Rubric
Test Weight	1.0
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s) (any one of the following)	
Endorsement 1	Medical Anatomy & Physiology
Endorsement 2	Dental Assistant
Endorsement 3	Emergency Medical Technician
Endorsement 4	Medical Assistant
Endorsement 5	Nurse Assistant
Endorsement 6	Pharmacy Technician
Endorsement 7	Surgical Technology
Endorsement 8	Biotechnology
Endorsement 9	Exercise Science/Sports Medicine

Updated: July 2025

STRAND 1

Students will develop a better understanding of the healthcare industry.
Students will gain greater insight into opportunities for employment and/or education within healthcare.

Performance Skills

Complete one or more of the following:

- Tour a medical or educational facility.
- Participate in a healthcare related job-shadow.
- Participate in guest speaker(s) presentations for students to learn about healthcare opportunities.

STRAND 2

Students will gain a greater understanding of how research and analytics impacts healthcare.

Standard 1

Students will use research skills to analyze a healthcare topic.

Performance Skills

Complete one of the following:

- Develop a research project addressing a healthcare topic using the scientific process and present your findings.
- Research career opportunities in healthcare and present your findings.

STRAND 3

Students will implement leadership skills throughout the course.

Standard 1

Students will demonstrate group leadership skills in the classroom.

Performance Skills

Demonstrate leadership in one or more of the following areas:

- Lead a team
- Create assignments for team members
- Follow directions from team leaders
- Practice ethical leadership
- Demonstrate effective communication (speaking and/or listening)

STRAND 4

Students will use various forms of technology throughout the course.

Standard 1

Students will recognize and apply current technological tools and their impact on healthcare.

Performance Skills

Students will use one or more of the following technological tools throughout the course.

- Examples may include:
  - Online surveys
  - Podcasts
  - Advanced presentation tools – Adobe Spark, Microsoft Sway, Prezi, PPT, etc.

- Video conferencing
- Websites
- Search engine optimization
- Electronic databases/journals
- New and upcoming technologies

Durable Skills

- Professionalism
- Collaboration
- Communication
- Leadership
- Innovation
- Adaptability

Skill Certification Test Points by Strand

No written Skill Certification exam - Project-based rubric.

STRANDS AND STANDARDS
EXERCISE SCIENCE/SPORTS MEDICINE

Course Description

This full-year course is designed to teach students components of exercise science/sports medicine, including exploration of therapeutic careers, medical terminology, anatomy and physiology, first aid, injury prevention principles, the healing process, rehabilitation techniques, therapeutic modalities, sport nutrition, sport psychology, and performance enhancement philosophies.

Intended Grade Level	11-12
Units of Credit	1.0
Core Code	36.01.00.00.040
Concurrent Enrollment Core Code	36.01.00.13.040
Prerequisite	None
Skill Certification Test Number	701
Skill Certification Cut Score	**74%**
Test Weight	1.0
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Exercise Science, Sport Medicine
Endorsement 2	N/A
Endorsement 3	N/A

STRAND 1

Students will explore the fundamental aspects of Exercise Science/Sports Medicine.

Standard 1

Identify Members of the Sports Medicine team.

- Recognize the primary members of the sports medicine team to include: Coach, Athlete, Parents, Team Physician, Certified Athletic Trainer, and Allied Health professionals.
- Recognize that other careers provide support to the sports medicine team.
- Compare and contrast the roles of each member of the sports medicine team.

Standard 2

Explore a variety of therapeutic careers and describe the job duties and skills, education required, job settings, and potential salary for each of the following:

- Athletic Trainer (AT)
- Physical Therapist (PT)
- Physical Therapy Assistant (PTA)
- Occupational Therapist (OT)
- Occupational Therapy Assistant (OTA)
- Exercise Physiologist
- Orthopedic Surgeon
- Physician
  - DO
  - MD
- Physician Assistant (PA)
- Nurse Practitioner (NP)
- Biomechanist
- Prosthetist
- Orthotist
- Podiatrist
- Chiropractor (DC)
- Sports Psychologist
- Emergency Medicine
  - EMT
  - Paramedic
- Certified Strength & Conditioning Specialist/Personal Trainer (CSCS)
- Registered Dietician (RD)
- Massage Therapist (LMT)

Standard 3

Explain legal issues and legal terminology.

- Discuss risk management in an athletic setting.
  - Types of sports
    - Collision sports
    - Contact sports
    - Non-contact sports
  - Surfaces
- Define legal terminology and discuss issues, including:
  - Assumption of risk
  - Battery

  - Failure to warn
  - Health Insurance Portability and Accountability Act (HIPAA)
  - Informed consent
  - Liability
  - Negligence
    - Duty of care
    - Breach of duty
    - Damage/injury occurred
    - Proximate cause
  - Malpractice
  - Commission
  - Omission
  - Standard of care
  - Statute of limitations
  - Good Samaritan law
- Discuss parameters of ethical conduct and associated issues, including:
  - Americans with Disabilities Act (ADA)
  - Cheating
  - Drug testing
  - Fair play and sportsmanship
  - Performance enhancing drugs
  - Scope of practice
  - Title IX
- Review preventative measures to reduce potential risks of litigation.
  - Medical History & Pre-participation Physical Examination
  - Carry liability insurance
  - Maintain professional credentials and appropriate continuing education
  - Appropriate documentation
  - Follow physician orders and recommendations
  - Have an emergency action plan (EAP)
  - Maintain adequate supervision
  - Maintain good rapport with the Sports Medicine Team

STRAND 2

Students will describe principles of sports psychology.

Standard 1

Identify the psychological implications of an injury to an athlete.

- Describe the five psychological stages an athlete experiences following an injury.
  - Denial
  - Anger
  - Bargaining
  - Depression
  - Acceptance
- Compare and contrast how some athletes may view pain.
  - Deny pain and loss of function.
  - Injury as a source of relief.

Standard 2

Identify effective psychological intervention skills.

- Describe the importance of goal setting.
    - Performance goals (SMART goals)
    - Specific
    - Measurable
    - Attainable/Achievable
    - Realistic/Relevant
    - Time based
    - Outcome goals
- Examine different relaxation techniques and how they can help performance.
    - Focused breathing
    - Progressive muscle relaxation
    - Visual Imagery

Standard 3

Identify potential problems associated with overtraining.

- Compare and contrast staleness and burnout.
- Identify interventions to prevent or treat staleness or burnout.
    - Remove from activity
    - Time off
    - Allow athlete to have more control
    - Decrease emotional and stressful demands
    - Avoid repetition
    - Sufficient attention to complaints and small injuries
    - Supportive and caring environment

Standard 4

Discuss different mental health challenges that athletes may deal with.

- Anxiety
    - Trauma induced anxiety
    - Stress related anxiety
    - Phobias that affect performance
- Depression
    - Causes of depression
        - Physical injuries
        - Overtraining
        - Pressure to perform
        - Loss of identity and social support
- Resources and coping strategies

STRAND 3

Students will describe the injury and healing process, including basic injury assessment.

Standard 1

Discuss the inflammatory response and the healing process.

- Compare and contrast acute and chronic injuries.
- Discuss the purpose of inflammation.

- Categorize the stages of acute injury healing and explain the processes involved in each.
- Acute (Inflammation) Phase
  - Signs and symptoms of inflammation
    - Heat
    - Redness
    - Swelling
    - Pain
    - Loss of function
  - Time frame – 48 to 72 hours
  - Define vasodilation and explain why it occurs.
  - Define hypoxia and explain its role in secondary cell death.
  - Compare and contrast the following methods to treat acute injuries:
    - Rest, Ice, Compression, Elevation (RICE)
    - Protect, Optimal Load, Ice, Compression, Elevation (POLICE)
    - Protection, Elevation, Avoid anti-inflammatories, Compression, Education & Load, Optimism, Vascularization, Exercise (PEACE & LOVE)
- Subacute (Repair and Regeneration) Phase
  - Time frame – 3 to 4 weeks
  - Explain the role of fibroblasts and collagen in scar tissue formation.
- Remodeling (Maturation) Phase
  - Time frame – up to one year
  - Define adhesions
  - Explain Wolff's Law

Standard 2

Explain an injury assessment: History, Inspection/Observation, Palpation, Special Tests (HIPS/HOPS).

- Identify the components included in obtaining an accurate history.
- Identify the components of an inspection/observation.
- Describe the process of palpation.
- Describe the purposes of special tests.
  - Range of Motion (ROM)
    - Passive
    - Active
    - Resistive
  - Stress Tests (structural integrity)
  - Neurological
  - Functional
- Discuss the decisions that can be made from a HIPS/HOPS evaluation.

Standard 3

Compare and contrast injury classifications.

- Describe first degree injuries.
- Describe second degree injuries.
- Describe third degree injuries.

Standard 4

Describe common fractures.

- Classifications
  - Open/compound

    - Closed
- Types
    - Compression
    - Depressed
    - Greenstick
    - Comminuted
    - Avulsion
    - Spiral
    - Transverse
    - Stress

Standard 5

Vocabulary

- Anatomical Planes
    - Sagittal Plane/Midsagittal
    - Frontal/Coronal
    - Transverse/Horizontal
- Signs & Symptoms
    - Acute
    - Chronic
    - Constriction
    - Dilation
    - Ecchymosis
    - Edema
    - Effusion
    - Inflammation
    - Joint laxity

STRAND 4

Students will explore specific sports injuries of the head and neck and apply athletic injury prevention principles.

Standard 1

Identify the anatomy of the head and neck.

- Bones
    - Frontal
    - Occipital
    - Parietal
    - Temporal
    - Mandible
    - Maxillae
    - Zygomatic
    - Nasal
    - Vertebrae
- Muscles
    - Sternocleidomastoid- neck lateral flexion
    - Trapezius – shoulder elevation
- Structures

    - Brain including meninges
    - Intervertebral discs
- Nerves
    - Cervical Plexus
    - Brachial Plexus

Standard 2

Describe common head and neck injuries as well as their mechanism of injury, signs and symptoms, treatment, and prevention.

- Recognize common injuries to the head and neck to include:
    - Concussion
    - Second impact syndrome
    - Subdural hematoma
    - Epidural hematoma
    - Cervical spine fracture
    - Brachial plexus injuries
    - Nose bleeds/epistaxis
    - Dental injuries
- Identify the mechanism of each injury (MOI).
- Identify the signs and symptoms of each injury.
- Indicate appropriate treatment for each injury.
- Describe injury prevention strategies.

Standard 3

Describe the basic principles and specialized equipment used in the prevention of athletic injuries.

- Recognize types and functions of protective equipment.
    - Helmet (including helmet covers), facemask, ear guards
    - Mouth guards
    - Neck collars/guards
    - Padding
    - Sports bras
    - Compression shorts/cup
- Discuss the legal ramifications of manufacturing, buying, and issuing equipment.
    - National Operating Committee on Standards for Athletic Equipment (NOCSAE) warning
    - Modification of equipment
    - Proper fit and selection
    - Use of defective or worn-out equipment

Standard 4

Vocabulary

- Amnesia
- Articulation
- Innervate
- Mechanism of Injury (MOI)
- Point tenderness
- Range of Motion (ROM)-Active, Passive, Resistive
- Referred Pain
- Lateral flexion
- Rotation

STRAND 5

Students will explore various aspects of sports nutrition.

Standard 1

Describe the basic components (kcal/gram, functions, energy vs. nutrients, healthy diet guidelines) of nutrition and the sources of the following nutrients.

- Carbohydrates
- Proteins
- Fats
- Vitamins
- Minerals
- Water

Standard 2

Examine the importance of fluid replacement and hydration.

- Examine the importance of water and its role in the body.
- Explain the correct process of hydration during athletic activity.
  - Identify the dangers of inappropriate hydration techniques.
    - Hyponatremia
    - Timing/Frequency
  - Identify the dangers of dehydration.
- Compare and contrast advantages and disadvantages of sports drinks.
  - Identify the role of sports drinks in hydration.
  - Discuss the importance of the correct chemical make-up of sports drinks.

Standard 3

Identify the components of a pre-event and post event meal and explain the value of each.

- Identify the recommended nutrients included in pre-event and post event meals.
- Identify foods that are easily digested.
- Identify foods that should be avoided.
- Identify when pre-event and post event meals should be eaten.
- Discuss the concept of carbohydrate loading and discuss the benefits.

STRAND 6

Students will explore the fundamentals of body composition, and the diseases and disorders related to body image.

Standard 1

Describe basic body composition.

- Define body composition.
- Compare and contrast the most common methods for analyzing body composition.
  - Dual Energy X-ray Absorptiometry (DXA)
  - Air displacement plethysmography - Bod Pod
  - Skin-fold calipers
  - Bio-Impedance Analysis (BIA)
  - Hydrostatic weighing
  - Emerging technologies
- Describe the parameters of safe weight loss and weight gain.

Standard 2

Recognize common conditions and disorders associated with nutrition.

- Explore the effects of generalized disordered eating.
- Identify signs, symptoms, and effects of Anorexia Nervosa.
- Identify signs, symptoms, and effects of Bulimia Nervosa.
- Identify signs, symptoms, and effects of Muscle Dysmorphia.
- Identify signs, symptoms, and effects of the Female Athlete Triad/Relative Energy Deficiency in Sport (RED-S).

STRAND 7

Students will explore specific sports injuries of the lower extremities and apply athletic injury prevention principles.

Standard 1

Identify the anatomy of the lower extremities.

- Bones
  - Femur
  - Tibia
  - Fibula
  - Patella
  - Talus
  - Calcaneus
  - Metatarsals
  - Phalanges
- Joints
  - Tibiofemoral
  - Patellofemoral
  - Talocrural
  - Subtalar
  - Midfoot
  - Metatarsophalangeal (MTP)
  - Proximal Interphalangeal (PIP)
  - Distal Interphalangeal (DIP)
- Soft Tissues
  - Iliotibial Band (ITB)
  - Patellar Tendon
  - Anterior Cruciate Ligament (ACL)
  - Posterior Cruciate Ligament (PCL)
  - Medial Collateral Ligament (MCL)
  - Lateral Collateral Ligament (LCL)
  - Lateral and Medial Meniscus
  - Achilles Tendon
  - Anterior Talofibular ligament (ATF)
  - Deltoid ligament
- Muscles
- Quadriceps – knee extension
- Hamstrings – knee flexion
- Peroneals – ankle eversion

- Tibialis Anterior – ankle dorsiflexion
- Tibialis Posterior – ankle inversion and plantarflexion
- Gastrocnemius – ankle plantarflexion
- Soleus – ankle plantarflexion

Standard 2

Describe common lower extremity injuries as well as their mechanism of injury, signs and symptoms, treatment, and prevention.

- Recognize common injuries to the lower extremity to include:
  - Cruciate/Collateral Ligament sprains
  - Meniscal injury
  - Patellofemoral injuries
  - Ankle sprains
  - Plantar Fasciitis
  - Turf toe
  - Thigh contusions
  - Quadriceps/Hamstring strains
  - Medial Tibial Stress Syndrome (MTSS)
  - IT Band Syndrome
- Identify the mechanism of each injury.
- Identify the signs and symptoms of each injury.
- Indicate appropriate treatment for each injury.
- Describe injury prevention strategies.
  - Shin Guards
  - Shoes
  - Other sport specific protection devices
  - Correcting biomechanics

Standard 3

Demonstrate theory and principles of prophylactic taping.

- Analyze the basic principles of prophylactic taping.
- Identify the necessary supplies and their purpose for prophylactic taping.
  - Athletic tape (various sizes)
  - Prewrap
  - Heel and lace pad
  - Adhesive spray
  - Shark/Scissors
- Explain the basic principles of proper tape removal.
- Explain the terminology associated with prophylactic taping procedures.
  - Anchor
  - Stirrup
  - Horseshoe
  - Spica
  - Heel-lock
  - Checkrein/Fan

Standard 4

Identify principles of protective bracing.

- Discuss the differences between functional bracing and prophylactic bracing.

- Identify the function of compression sleeves

Standard 5

Vocabulary

- General Terms
  - Atrophy
  - Bursa
  - Cartilage
  - Crepitus
  - Ligament
  - Tendon
- Anatomical Positions and Directions
  - Superior/Inferior
  - Anterior/Posterior
  - Medial/Lateral
  - Proximal/Distal
  - Superficial/Deep
  - Ventral/Dorsal
  - Prone/Supine
  - Unilateral/Bilateral/Contralateral
  - Valgus/Varus
- Movements of the Foot and Ankle
  - Inversion/Eversion
  - Dorsiflexion/Plantarflexion

STRAND 8

Students will examine performance enhancement philosophies.

Standard 1

Define terms associated with performance enhancements.

- Cardiovascular endurance
- Muscular endurance
- Power
- Speed
- Strength

Standard 2

Discuss general conditioning principles.

- Adaptation
- Overload
- Specificity
- Reversibility
- Periodization

Standard 3

Examine the role the cardiovascular and respiratory systems have on fitness and athletic performance.

- Identify and describe the structures and functions of the cardiovascular and respiratory systems and their interrelationship.
  - Heart

        - 4 chambers
        - 4 valves
        - 5 blood vessels
    - Lungs - Oxygen exchange from alveoli to capillaries
- Identify vital signs related to the cardiovascular and respiratory systems.
    - Describe and accurately measure blood pressure (systolic/diastolic).
    - Describe and accurately measure respiratory rate.
    - Describe and accurately measure pulse rate.
    - Describe lung volumes.
        - Tidal volume
        - Vital capacity
    - Describe the importance of cardiac output, stroke volume, and heart rate during exercise.
- Examine different types of tests used to quantify cardiovascular fitness.
    - VO2max
    - Step tests
    - Run tests
    - Walk tests
- Describe the effects exercise has on the cardiovascular and respiratory systems.
    - Immediate effects of exercise
        - Heart rate
        - Ventilation
    - Long term effects of exercise
        - Resting heart rate
        - Heart rate variability (HRV)
        - Stroke volume
        - Cardiac output
- Compare and contrast aerobic/anaerobic training.
- Examine the importance of a warmup/cool down in a training program.
- Examine different cardiovascular training methods.
    - Interval
    - Fartlek
    - Circuit
    - Continuous
- Apply general conditioning principles to improve cardiovascular fitness.
    - Rate of perceived exertion (BORG scale)
    - Target heart rate

Standard 4

Examine the effects of the environment on training and performance.

- Discuss the effects of high and low altitude.
- Describe the effects of acclimatization.
- Recognize the effects of travel on the body.

STRAND 9

Students will examine strength training principles, flexibility, and ergogenic aids/performance enhancing drugs (PED).

Standard 1

Examine the role strength training has on fitness and athletic performance.

- Describe the sliding filament model of muscle contraction.
- Sarcomere proteins
  - Actin
  - Myosin
- Compare and contrast the difference between slow twitch and fast twitch muscle fibers.
  - Common slow twitch athletic activities
  - Common fast twitch athletic activities
- Compare and contrast different types of movements related to strength training.
  - Isometric/Isotonic/Isokinetic
  - Eccentric/Concentric
  - Closed chain/Open chain
  - Plyometrics
- Identify methods of resistance training.
- Apply general conditioning principles to improve strength.
  - Speed
  - Muscular endurance
  - Power
  - Periodization

Standard 2

Examine the importance of flexibility in fitness and athletic performance.

- Explain the general guidelines of flexibility.
  - Define ROM and how it relates to fitness and athletic performance.
  - Identify the benefits of flexibility.
    - Decrease risk of injury.
    - Reduce muscle soreness.
    - Improve muscular balance and postural awareness.
  - Investigate the risks of hypermobility.
  - Demonstrate proper timing of flexibility techniques.
    - Before activity
    - After activity
- Identify the different methods to increase flexibility and the safety/effectiveness of each.
  - Static stretching
  - Ballistic stretching
  - Dynamic stretching
  - Proprioceptive Neuromuscular Facilitation (PNF) stretching
    - Contract/Relax
    - Hold/Relax

Standard 3

Compare and contrast the physiological and psychological effects of ergogenic aids.

- Define ergogenic aid.
- Recognize and discuss the effects and possible dangers of common ergogenic aids/performance enhancing drugs (PED).
  - Stimulants
    - Energy drinks
    - Pre-workout
    - Nicotine
  - Narcotics
  - Anabolic steroids
  - Beta blockers
  - Diuretics
  - Human growth hormone (HGH)
  - Blood doping products
    - Blood transfusions
    - Erythropoietin (EPO)
  - Anesthetics
  - Corticosteroids
  - Creatine

STRAND 10

Students will explore specific sports injuries of the upper extremities and apply athletic injury prevention principles.

Standard 1

Identify the anatomy of the upper extremity.

- Bones
  - Scapula
  - Clavicle
  - Humerus
  - Radius
  - Ulna
  - Carpals
  - Metacarpals
  - Phalanges
- Joints
  - Shoulder
    - Sternoclavicular (SC)
    - Acromioclavicular (AC)
    - Glenohumeral (GH)
    - Scapulothoracic (ST)
  - Elbow
  - Wrist
  - Metacarpophalangeal (MCP)
  - Distal Interphalangeal (DIP)
  - Proximal Interphalangeal (PIP)
- Soft tissues

    - Sub-acromial bursa
    - AC ligaments
    - Glenoid labrum
- Muscles
    - Deltoid – Abduction of arm
    - Pectoralis Major – Shoulder horizontal adduction
    - Latissimus Dorsi – Shoulder extension and adduction
    - Rotator Cuff (SITS)
        - Supraspinatus - Shoulder abduction
        - Infraspinatus – Shoulder external rotation
        - Teres minor - Shoulder external rotation
        - Subscapularis – shoulder internal rotation
    - Biceps brachii – elbow flexion and shoulder flexion
    - Triceps brachii – elbow extension
    - Wrist flexors
    - Wrist extensors

Standard 2

Describe common upper extremity injuries as well as their mechanism of injury, signs and symptoms, treatment, and prevention.

- Upper extremity injuries
    - Clavicle fracture
    - Impingement syndrome
    - Rotator cuff injuries
    - Glenohumeral dislocation/subluxation
    - AC joint separation
    - Epicondylitis
        - Lateral (Tennis elbow)
        - Medial (Little leaguer's elbow)
    - Wrist hyperextension
    - Ulnar collateral ligament (UCL) sprain
        - Elbow
        - Thumb (Gamekeeper's Thumb)
    - Interphalangeal dislocation
- Identify the mechanism of each injury.
- Identify the signs and symptoms of each injury.
- Indicate the appropriate treatment for each injury.
- Describe injury prevention strategies.

Standard 3

Vocabulary

- Movements
    - Flexion/Extension/Hyperextension
    - Abduction/Adduction
    - Pronation/Supination
    - Protraction/Retraction
    - Elevation/Depression
    - Horizontal Abduction/Adduction
    - Rotation

    - Internal rotation
    - External rotation
  - Circumduction
- Movements of the Wrist & Thumb
  - Radial/Ulnar deviation
  - Opposition

STRAND 11

Students will be able to recognize common injuries and administer proper care.

Standard 1

Identify proper personal protective equipment (PPE)/body substance isolation (BSI) precautions.

Standard 2

Identify soft tissue injuries and skin conditions.

- Differentiate signs, symptoms, and treatment for:
  - Abrasions
  - Avulsions
  - Puncture
  - Bites
  - Blisters
  - Contusions
  - Lacerations
  - Stings
- Differentiate signs, symptoms, and treatment for:
  - Fungal infections
    - Tinea corporis -Ring worm
    - Tinea cruris - Jock itch
    - Tinea pedis - Athlete's foot
  - Bacterial infections
    - Impetigo
    - Methicillin Resistant Staphylococcus Aureus (MRSA)
  - Viral Infections
    - Veruca vulgaris – common warts
    - Veruca plantaris – plantar warts
  - Eczema

Standard 3

Recognize abdominal injuries, bleeding, and shock.

- Discuss external bleeding.
- Demonstrate proper procedures to control bleeding.
  - Apply direct pressure
  - Cover with sterile gauze and apply roller bandage.
  - Determine if tourniquet is needed
- Identify signs, symptoms, and treatment of internal bleeding.
  - Identify signs, symptoms, and treatment of abdominal injuries.
  - Ruptured spleen
  - Appendicitis

    - Hernia
- Identify signs, symptoms and treatment for shock.

Standard 4

Discuss immobilization techniques.

- Identify fracture signs and symptoms.
- Explain the steps of immobilization.
    - Splint in the position found.
    - Immobilize the injured area.
    - Check circulation distal to the injury.
- Explain head/neck stabilization.
    - Maintain stabilization in the position found.
    - Monitor airway, breathing, and circulation (ABC's).

Standard 5

Recognize and provide treatment for environmental conditions.

- Compare and contrast the causes, signs, symptoms, and treatment of heat illnesses.
    - Dehydration
    - Heat/muscle cramps
    - Heat exhaustion
    - Heat stroke
- Compare and contrast the causes, signs, symptoms, and treatment of cold exposure.
    - Hypothermia
    - Frostbite

Standard 6

Describe the treatment for medical conditions.

- Seizures
- Syncope/Fainting
- Blood sugar related issues
- Anaphylactic shock
- Asthma
- Exertional sickling
- Sudden cardiac arrest

Standard 7

Vocabulary

- General Vocabulary Terms
    - Cyanosis
    - Diagnosis
    - Incision
    - Palpation
    - Prognosis
    - Reduction
    - Shock
- Injuries
    - Bursitis
    - Dislocation
    - Subluxation

- Fracture
- Hematoma
- Separation
- Sprain
- Strain

STRAND 12

Students will explain therapeutic modalities and rehabilitation techniques.

Standard 1

Explore therapeutic modalities.

- Identify the purpose of therapeutic modalities.
- Explain how to properly select the use of therapeutic modalities.
- Identify the Gate Control Theory as a principle of pain management and describe the physiological process of the theory.

Standard 2

Describe the physiological effects, indications, contraindications, and application of the following:

- Cryotherapy
  - Ice packs
  - Ice massage
  - Ice immersion (cryokinetics)
  - Cold whirlpool
  - Chemical coolant
- Thermotherapy
  - Heat packs
  - Ultrasound
  - Hot whirlpool
- Electrotherapy
- Manual Therapy
  - Massage
  - Cupping
  - Scraping techniques

Standard 3

Discuss the components and goals of a rehabilitation program.

- Identify the general guidelines of a rehabilitation program.
  - Individualize each program
  - Optimal loading of tissues through all phases
  - Use a variety of equipment
  - Common mistakes
    - Treating only the symptoms rather than also addressing the cause
    - Not addressing the contralateral side
    - Not addressing postural defects, anatomical malalignment, and biomechanical imbalances
  - Appropriate goal setting.
- Components of a rehabilitation program.
  - Phase I
    - Body conditioning/maintain cardiovascular fitness throughout all phases

    - Control swelling
    - Control pain
    - Increase range of motion
  - Phase II
    - Restore full range of motion
    - Strength, endurance, speed, power in all muscle groups
    - Begin skill patterns and proprioception
  - Phase III
    - Functional and sport specific skills
    - Restore balance and proprioception
    - Return to sport
  - Relate the different exercise principles to rehabilitation.
    - Specific Adaptations to Imposed Demands (SAID) principle
    - Overload

Standard 4

Vocabulary

- Analgesic
- Contraindicate
- Cryotherapy
- Hydrotherapy
- Indicate
- Modality
- Thermotherapy
- Vasoconstrictor
- Vasodilator

Performance Skills

- Present and answer questions about an Exercise Science/Sports Medicine related career.
- Students will design and illustrate a modification to an existing piece of protective equipment or create a new piece of protective equipment. Can be done as a team or individual.
- Document an injury evaluation using the SOAP format:
  a. Subjective
  b. Objective
  c. Assessment
  d. Plan
- Simulate a HIPS/HOPS assessment.
- Tape an ankle using a standard prophylactic taping method.
- Tape an arch using the standard prophylactic taping method. (Optional additional skill)
- Tape a thumb using a standard prophylactic taping method.
- Tape a wrist using the standard prophylactic taping method. (Optional additional skill)
- Demonstrate crutch fitting to any size individual and instruct patient in proper use.
- Lead a team to stabilize head/neck in position found. (Optional additional skill)
- Demonstrate the proper techniques of static stretching for ALL major muscle groups.
- Demonstrate a dynamic stretch for the lower extremity.
- Prepare an ice bag/pack.
- Apply a compression wrap to an ankle.
- Apply a compression wrap to a knee. (Optional additional skill)

Durable Skills

- Professionalism
- Collaboration
- Communication
- Leadership
- Innovation
- Adaptability

Test Name	Test Number	Number of Test Points by Strand												Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10	11	12		
Exercise Science/ Sports Medicine	701	5	3	9	6	3	3	15	6	6	7	7	7	77	60

KEY VOCABULARY CLARIFICATIONS

Active Range of Motion (AROM): movement of a joint by the individual themselves.

Adhesion: a band of scar tissue that joins two surfaces not usually connected.

Air displacement plethysmography (Bod Pod): method used to measure body composition by estimating body density; by determining the volume of air it displaces inside an enclosed chamber.

Anchor: the starting and ending points of tape application.

Articulation: a point where two bones meet; a joint.

Bio-Impedance Analysis (BIA): method used to estimate body composition by measuring the resistance of electrical currents flowing through the body.

Blood doping: misuse of certain techniques and/or substances to increase the number of circulating red blood cells to increase endurance performance.

Checkrein/Fan: reinforced tape to prevent movement.

Closed chain: movement where the distal end is fixed (hand or foot), and the proximal end can move.

Contracture: permanent tightening of muscles, tendons, skin or other soft tissues causing joint stiffness.

Cryokinetics: rehabilitative exercise technique combining cryotherapy with active movement.

Cupping: a manual therapy technique using suction cups to pull blood into the skin.

Depression:

- movement of a body part downward (or inferior)
- type of skull fracture where broken bone is forced inward (depressed)
- mental disorder that negatively affects how people feel, think, and behave. Characterized by persistent feelings of sadness and loss of interest in activities.

Dual Energy X-ray Absorptiometry (DXA): a medical imaging technique used to measure bone density and body composition.

Fixation: process of stabilizing or aligning broken bones or damaged joints to facilitate healing.

Gate Control Theory: a principle of pain perception where the spinal cord can modulate which pain signals can be sent to the brain.

Horseshoe: a piece of felt used to control swelling around the malleolus after an ankle injury.

Hyponatremia: a dangerous condition where there is a low level of sodium in the blood.

Meniscus: fibrous cartilage between the femur and tibia

Methicillin Resistant Staphylococcus aureus (MRSA): a bacterial infection that can be resistant to several antibiotics.

Modality: a method or tool used to produce a therapeutic effect on human tissue.

Open chain: movement where the distal end is free to move (hand or foot), and the proximal end is fixed.

Optimal load: a resistance that is both effective and safe for promoting tissue functional recovery.

Passive Range of Motion (PROM): joint movement performed by an external force such as another person or device, without any muscular effort from the individual.

Pronation: turning the hand upward Reduction: the process of restoring a bone or joint to its natural position, such as after a fracture or dislocation.

Proprioception: body's awareness of its own position and movement in space.

Proprioceptive Neuromuscular Facilitation (PNF): an advanced form of flexibility training that involves both stretching and contracting (activation) of the muscle group being targeted in order to achieve maximum static flexibility.

Rapport: a close and harmonious relationship in which the people or groups concerned understand each other's feelings or ideas and communicate well.

Relative Energy Deficiency in Sport (RED-S): stands for Relative Energy Deficiency in Sport; a syndrome that occurs when an athlete's energy intake is insufficient to meet the demands of training and daily life, leading to impaired physiological and psychological functions.

Scraping techniques: a manual therapy technique used in physical therapy to address soft tissue injuries and

dysfunctions; involves using specialized tools to apply targeted pressure to muscles, tendons, and fascia, breaking down scar tissue and adhesions, reducing muscle tension, and promoting healing.

Separation: occurs when the outer end of the collarbone (clavicle) separates from the end (acromion) of the shoulder blade because of torn ligaments. This injury occurs most often from a blow to the top of the shoulder or a fall onto the shoulder.

SOAP note: stands for Subjective, Objective, Assessment, Plan; way to document injuries and injury care.

Specificity (SAID): a general conditioning principle that stands for specific adaptations for imposed demands.

Stress Tests:

- measure how well your heart, lungs, and blood vessels work together to deliver oxygen to muscles during exercise.
- tests that apply forces to a joint while observing for excessive joint opening (laxity) or pain indicating possible ligament damage

Supination: turning the palm upward in the lower extremity, an outward rolling of the foot, causing the weight to be distributed primarily on the outer side of the foot.

Talocrural: a joint of the lower extremity that is the junction between the talus and the tibia and fibula; ankle joint.

Tinea corporis: ringworm.

Tinea cruris: jock itch.

Tinea pedis: athlete's foot.

Ultrasound: a thermotherapy technique that utilizes sound waves.

Wolff's Law: a principle in anatomy and physiology, states that bone tissue will adapt to the mechanical stresses it experiences.

STRANDS AND STANDARDS
MEDICAL ANATOMY & PHYSIOLOGY

Course Description

This full-year course provides students with an in-depth study of several healthcare careers. Topics include intermediate anatomy & physiology, medical terminology, diseases and disorders, and medical ethics. The class is designed to prepare students for the Advanced Medical Anatomy and Physiology course and/or for a variety of health science programs.

Intended Grade Level	10-12
Units of Credit	1.0
Core Code	36.01.00.00.110
Concurrent Enrollment Core Code	36.01.00.13.110
Prerequisite	None
Skill Certification Test Number	702
Skill Certification Cut Score	**72%**
Test Weight	1.0
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Medical Anatomy & Physiology
Endorsement 2	Nurse Assistant
Endorsement 3	NA

Updated: August 2025

STRAND 1

Students will **develop and utilize models** to describe how the body is organized, how it functions, and how it maintains a stable internal environment (homeostasis).

Standard 1

Contrast the sciences of anatomy and physiology.

Standard 2

Describe the six levels of structural organization of the human body and their interrelationship.

- Chemical
- Cellular
- Tissue
- Organ
- System
- Organism

Standard 3

Compare and contrast the types of metabolism:

- Anabolic
- Catabolic

Standard 4

Identify commonly used planes to divide the body based upon anatomical position.

- Sagittal
- Midsagittal
- Transverse (horizontal)
- Frontal (coronal)

Standard 5

Apply directional terms used in human anatomy.

- Anterior
- Posterior
- Medial
- Lateral
- Proximal
- Distal
- Superficial
- Deep
- Superior
- Inferior
- Dorsal
- Ventral

Standard 6

Identify the body cavities and locate the following organs within each cavity.

- Dorsal Cavity
  - Vertebral (spinal) -spinal cord
  - Cranial-brain
- Ventral Cavity

- Thoracic
  - Mediastinum-heart, bronchi, esophagus, thymus.
  - Pericardial-heart
  - Pleural-lungs
- Abdominopelvic Cavity
  - Abdominal-liver, spleen, intestines, kidneys, stomach, pancreas
  - Pelvic-intestines, urinary bladder, sex organs

Standard 7

Identify the major organ(s) in each abdominal quadrant.

- Right upper quadrant (RUQ)- -liver, gallbladder, right kidney
- Right lower quadrant (RLQ) - -cecum, appendix, right ovary
- Left upper quadrant (LUQ)- -spleen, stomach, left kidney, pancreas
- Left lower quadrant (LLQ)- -left ovary

Standard 8

Examine the effects of stress on homeostasis.

Standard 9

Differentiate between negative and positive feedback mechanisms to maintain homeostasis. Give examples of each.

- Negative feedback examples: blood pressure, blood glucose, thermoregulation, etc.
- Positive feedback examples: childbirth, breast feeding, blood clotting, etc.

STRAND 2

Students will **construct an explanation** of the basic principles of body chemistry (matter, structure, and function).

Standard 1

Review the following terms and concepts.

- States of matter
- Elements
- Basic components of the atom
  - Nucleus
  - Electrons
  - Protons
  - Neutrons

Standard 2

Identify the four major elements in the body.

- Carbon - C
- Hydrogen - H
- Oxygen - O
- Nitrogen - N

Standard 3

Differentiate between:

- Compound
- Molecule

Standard 4
Describe the characteristics of bonds.
- Ionic bonds
- Covalent bonds
  - Polar
  - Non-polar
- Hydrogen bonds

Standard 5
Analyze solute ions in a solution (electrolytes) and differentiate between:
- Cation
- Anion

Standard 6
Describe the properties of water and how it is utilized in the human body.
- Universal solvent
- Transport
- Lubricant
- Heat capacity
- Chemical reactions

Standard 7
Distinguish between inorganic compounds and organic compounds.

Standard 8
Describe the structures and functions of the following organic macromolecules and give an example of each:
- Carbohydrates
- Proteins (amino acids)
- Lipids
- Nucleic acids (RNA, DNA)

Standard 9
Define pH and identify the different solutions based on the pH scale.
- Acidic
- Basic (alkaline)
- Neutral
- Blood pH = 7.35 to 7.45

Standard 10
Describe how the body produces energy during cellular respiration.
- ATP ↔ ADP + P + ENERGY

STRAND 3
Students will **construct and develop models** to describe basic structures and functions of cells.

Standard 1
Identify the principal parts of a generalized animal cell and their functions.
- Nucleus
  - Nucleolus

    - Chromosome
        - Chromatin
        - Gene (DNA, RNA)
- Cytoplasm
    - Cytosol
- Organelles
    - Ribosome
    - Endoplasmic Reticulum (smooth, rough)
    - Golgi complex (body)
    - Lysosome
    - Mitochondria
    - Centrosome (centrioles)
- Cell membrane
    - Components of the phospholipid bilayer
    - Modifications of the cell membrane
        - Microvilli - absorption
        - Cilia - transports products along the surface of the cell
        - Flagella – transports the cell

Standard 2
Describe a selectively permeable membrane and factors which influence permeability.

Standard 3
Contrast intracellular and extracellular fluid in terms of location and composition.

Standard 4
Describe each of the following cellular transport processes and classify them as active or passive.

- Passive processes
    - Simple diffusion
    - Facilitated diffusion
    - Filtration (dialysis)
    - Osmosis
- Active processes
    - Endocytosis (phagocytosis)
    - Exocytosis
    - Active transport (Sodium/Potassium pump)

Standard 5
Compare and contrast the osmotic effects that occur when a cell is placed in the following solutions:

- Isotonic
- Hypotonic
- Hypertonic

Standard 6
Compare and contrast:

- Mitosis
- Meiosis

STRAND 4

Students will **plan and carry out an investigation** to compare and contrast the basic structures and functions of histology, and the integumentary system.

Standard 1

Identify and describe the general characteristics and functions of each of the four principal types of tissues.

- Epithelial-squamous, cuboidal, columnar
- Connective-adipose, cartilage, dense fibrous, blood, bone
- Muscular-skeletal, smooth, cardiac
- Nervous – neurons, neuroglial cells

Standard 2

Differentiate between the four basic types of tissue membranes.

- Mucous
- Serous
  - Visceral
  - Parietal
- Synovial
- Cutaneous

Standard 3

Identify and describe the structures and functions of the integumentary system components.

- Skin
- Glands
- Hair
- Nails

Standard 4

Identify the major layers of skin.

- Epidermis
- Dermis
- Subcutaneous (hypodermis)

Standard 5

Contrast the following types of glands:

- Exocrine glands (sudoriferous, sebaceous)
- Endocrine glands (hormones)

Standard 6

Explain the following diseases and disorders of the integumentary system.

- Skin cancers
  - Basal cell carcinoma
  - Squamous cell carcinoma
  - Malignant melanoma
- Decubitus ulcers
- Eczema
- Acne
- Lesion
- Burns

- 1st degree (superficial)
- 2nd degree (partial thickness)
- 3rd degree (full thickness)

STRAND 5

Students will **develop and use models** to relate the structure of the skeletal system to its functional role in movement, protection, and support.

Standard 1

Describe the general functions of the skeletal system.

- Structure/support
- Muscle attachment/movement
- Mineral storage
- Hematopoiesis

Standard 2

Identify the roles of the following in bone growth and ossification:

- Osteoblasts
- Osteocytes
- Osteoclasts

Standard 3

Identify the four shapes of bones with characteristics and examples of each.

- Short
- Flat
- Irregular
- Long

Standard 4

Identify the features of a long bone.

- Periosteum
- Diaphysis
- Epiphysis
- Medullary cavity
- Red marrow
- Yellow marrow
- Articular cartilage
- Endosteum
- Compact bone
- Spongy bone

Standard 5

Define and locate the following bone markings.

- Foramen
- Meatus
- Sinus
- Fossa
- Condyle
- Tuberosity

- Trochanter
- Tubercle
- Process

Standard 6

Describe and differentiate between the following terms:

- Suture
- Fontanel

Standard 7

Locate the following bones of the axial and appendicular skeletons.

- Axial Skeleton
  - Mandible
  - Maxilla
  - Zygomatic
  - Frontal
  - Parietal
  - Occipital
  - Sphenoid
  - Ethmoid
  - Hyoid
  - Temporal
  - Vertebrae
  - Ribs
  - Sternum
- Appendicular Skeleton
  - Clavicle
  - Scapula
  - Pelvic bone
    - Ilium
    - Ischium
    - Pubis
  - Femur
  - Patella
  - Tibia
  - Fibula
  - Tarsals
  - Metatarsals
  - Phalanges (hands and feet)
  - Humerus
  - Ulna
  - Radius
  - Carpals
  - Metacarpals

Standard 8

Contrast the average number, location, and function of each of the five groups of vertebrae.

- Cervical
- Thoracic

- Lumbar
- Sacral
- Coccygeal

Standard 9
Explain the structural and functional classifications of articulations.
- Structural:
  - Fibrous
  - Cartilaginous
  - Synovial
- Functional:
  - Synarthrotic
  - Amphiarthrotic
  - Diarthrotic

Standard 10
Differentiate between ligaments and tendons.

Standard 11
Explain the following diseases and disorders of the skeletal system.
- Herniated disk
- Osteoarthritis
- Osteoporosis
- Scoliosis
- Kyphosis
- Lordosis
- Spina bifida
- Rheumatoid arthritis (RA)

STRAND 6
Students will **develop and use models** to relate the structure of the muscular system to its functional role in movement, protection, and support.

Standard 1
Describe the general functions of the muscular system.
- Thermogenesis
- Produce movement (muscle contractions)
- Maintains posture
- Protects internal organs
- Controls volume of hollow body organs

Standard 2
Describe the four characteristics of muscle tissue.
- Elasticity
- Excitability (irritability)
- Extensibility
- Contractility

Standard 3
Contrast the general location, microscopic appearance, control, and functions of the three specific types of muscle tissue.
- Skeletal muscle
- Smooth muscle
- Cardiac muscle

Standard 4
Identify the proteins of the sarcomere.
- Actin (thin filament)
- Myosin (thick filament)

Standard 5
Describe what occurs at the neuromuscular junction.
- Nerve impulse (action potential)
- Acetylcholine (Ach) neurotransmitter
- Muscle contraction stimulated

Standard 6
Describe the sliding-filament theory of muscle contraction.

Standard 7
Define the following terms:
- Origin
- Insertion

Standard 8
Review terms of movement:
- Flexion/extension
- Abduction/adduction
- Plantar flexion/dorsiflexion
- Rotation

Standard 9
Explain the role of the following:
- Prime movers (agonists)
- Antagonists
- Synergist
- Fixators

Standard 10
Describe the locations and functions of the following skeletal muscles:
- Masseter – jaw elevation
- Sternocleidomastoid – neck lateral flexion
- Trapezius – shoulder elevation
- Biceps brachii- elbow and shoulder flexion
- Triceps brachii- elbow extension
- Deltoid – abduction of arm
- Diaphragm – inflation of lungs
- Pectoralis major – shoulder horizontal adduction

- Latissimus dorsi – shoulder extension and adduction
- Rectus abdominis – trunk flexion
- External oblique – trunk flexion and rotation
- Gastrocnemius – ankle plantarflexion
- Tibialis anterior – ankle dorsiflexion
- Soleus – ankle plantarflexion
- Hamstrings
  - Semimembranosus – knee flexion
  - Semitendinosus – knee flexion
  - Biceps femoris – knee flexion
- Quadriceps
  - Rectus femoris – knee extension and hip flexion
  - Vastus lateralis - knee extension
  - Vastus medialis - knee extension
  - Vastus intermedius - knee extension
- Gluteus maximus – hip extension
- Sartorius – hip flexion, abduction and external rotation

Standard 11

Explain the following diseases and disorders of the muscular system.

- Fibromyalgia
- Muscular dystrophy
- Medial tibial stress syndrome
- Compare and contrast the following, describe the three degrees of injury:
  - Sprain
  - Strain

STRAND 7

Students will **develop and use models** to relate the structure of the nervous system and special senses to its functional roles in detection, interpretation and response to information.

Standard 1

Describe the three broad functions of the nervous system.

- Sensory
- Integration
- Motor

Standard 2

Describe the general organization of the nervous system.

- Central Nervous System (CNS)
  - Brain
  - Spinal Cord
- Peripheral Nervous System (PNS)
  - Spinal nerves
    - 31 pairs
  - Cranial nerves
    - I-XII
  - Subdivisions

- Autonomic Division
  - Sympathetic
  - Parasympathetic
- Somatic Division

Standard 3

List the functions, structures, and locations of neurons and neuroglial cells.

- Neuron
- Astrocytes
- Microglia
- Oligodendrocytes
- Ependymal cells
- Schwann cells
- Satellite cells

Standard 4

Contrast white matter and gray matter of nervous tissue.

Standard 5

Identify the structures responsible for the maintenance and protection of the central nervous system.

- Meninges
  - Dura mater
  - Arachnoid mater
  - Pia mater

Standard 6

Describe the location and function of cerebrospinal fluid (CSF).

- Ventricles
- Subarachnoid space

Standard 7

Identify and describe the structures and functions of the brain.

- Cerebrum
  - Frontal
  - Parietal
  - Temporal
  - Occipital
- Cerebellum
- Brain stem
  - Medulla oblongata
  - Pons
  - Midbrain
- Diencephalon
  - Thalamus
  - Hypothalamus

Standard 8

Sequence the major events when the nerve impulse (action potential) is initiated and transmitted through a neuron. (All or None Principle)

Standard 9

Explain the role of each of the components of a reflex arc.

- Reflex
- Reflex arc
  - Receptor
  - Sensory neuron
  - Association (interneuron) neuron
  - Motor neuron
  - Effector

Standard 10

Explain the following diseases and disorders of the nervous system.

- Amyotrophic Lateral Sclerosis (ALS)
- Alzheimer's Disease
- Bacterial meningitis
- Cerebral palsy
- Epilepsy
- Multiple Sclerosis (MS)
- Guillain-Barre syndrome
- Parkinson's Disease
- Cerebrovascular Accident (CVA)-stroke

Standard 11

Identify the principle anatomical structures and functions of the eye.

- Accessory structures
  - Eyelid
  - Conjunctiva
  - Lacrimal apparatus
  - Extrinsic muscles
- Layers of the eyeball
  - Fibrous tunic
    - Sclera
    - Cornea
  - Vascular tunic
    - Choroid
    - Ciliary body
    - Iris
    - Lens
    - Pupil
  - Nervous tunic
    - Retina

Standard 12

Identify the principle anatomical structures and functions of the ear.

- Outer ear
  - Auricle
  - Auditory Canal
- Middle ear
  - Tympanic cavity

    - Tympanic membrane
    - Auditory (Eustachian) tube
    - Auditory ossicles
        - Malleus
        - Incus
        - Stapes
- Inner ear
    - Semicircular canals
    - Vestibule
    - Cochlea & Organ of Corti

Standard 13

Identify and describe the principle anatomical structures and functions associated with sense of taste and smell.

- Gustatory cells (taste buds)
- Olfactory bulb

Standard 14

Explain the following diseases and disorders associated with special senses.

- Ametropia – abnormal refracted light
    - Myopia
    - Hyperopia
    - Presbyopia
- Cataracts
- Conjunctivitis
- Strabismus
- Glaucoma
- Macular degeneration
- Vertigo
- Tinnitus
- Middle ear infection (Otitis Media)
- Deafness
    - Conductive
    - Sensorineural

STRAND 8

Students will **investigate and analyze** how the hormones of the endocrine system regulate (effect) physical and chemical processes to maintain homeostasis.

Standard 1

Describe the general functions of the endocrine system.

- Regulates body processes.
- Regulates growth, development, and maturation.

Standard 2

Describe a hormone and how it functions in the body.

Standard 3

Describe the location, secretion, and functions of the major endocrine glands.

- Pituitary Gland-found in the hypophyseal fossa "Sella Turcica"
  - Anterior Pituitary (adenohypophysis)
    - Human Growth Hormone (HGH) – stimulates cell growth
    - Thyroid Stimulating Hormone (TSH) – targets thyroid gland
    - Adrenocorticotropic Hormone (ACTH) – targets adrenal cortex to release cortisol
  - Posterior Pituitary (neurohypophysis)
    - Antidiuretic Hormone (ADH); also known as vasopressin – targets kidneys for water retention
    - Oxytocin Hormone (OT) – targets uterus for child birthing; targets breast tissue for milk release
- Thyroid Gland-found inferior to the larynx
  - Thyroxine (T4) – targets cells increasing metabolism
  - Triiodothyronine (T3) – targets cells increasing metabolism
- Adrenal Gland-found atop the kidneys
  - Adrenal Cortex
    - Cortisol
      - Coping with long term stress
      - Anti-inflammatory by suppressing white blood cells
  - Adrenal Medulla- sympathetic stimulus for sustained "Fight or Flight"
    - Epinephrine- (adrenaline) – increasing cell metabolism
    - Norepinephrine- (noradrenaline) - increasing cell metabolism
- Pancreas Gland-Exocrine/Endocrine gland in LUQ posterior to the stomach
  - Insulin – released from beta cells to target cells to decrease blood sugar
  - Glucagon - released from alpha cells to break down glycogen to increase blood sugar

Standard 4

Explain the following diseases and disorders of the endocrine system.

- Dwarfism
- Gigantism
- Acromegaly
- Hypothyroidism
  - Myxedema
  - Congenital hypothyroidism
- Hyperthyroidism (Graves' disease)
  - Goiter
  - Exophthalamos
- Diabetes mellitus
  - Type I
  - Type II
- Diabetes insipidus
- Cushing's syndrome

STRAND 9

Students will **obtain, evaluate and communicate information** that explains how the blood obtains oxygen, transports nutrients, and removes waste (matter).

Standard 1

Identify and describe the components of blood and their functions.

- Erythrocytes
  - Shapes (normal and abnormal)
  - Function of hemoglobin
- Leukocytes
  - Granulocytes
    - Neutrophils
    - Basophils
    - Eosinophils
  - Agranulocytes
    - Monocytes
    - Lymphocytes
- Thrombocytes
- Plasma

Standard 2
Describe the process of hemostasis.
- Vascular spasm
- Platelet plug formation
- Coagulation

Standard 3
Contrast a thrombus and an embolus.

Standard 4
Identify the antigens found on the erythrocytes and the antibodies that determine the ABO blood types and the Rh factor.

Standard 5
Explain the following diseases and disorders associated with the blood.
- Anemias
  - Nutritional
  - Pernicious
  - Hemorrhagic
  - Hemolytic
  - Sickle cell
  - Aplastic
- Hemolytic disease of the newborn
- Hemophilia
- Leukemia
- Mononucleosis
- Polycythemia

STRAND 10
Students will **construct an explanation** describing the structures and functions of the lymphatic system.

Standard 1
Identify the components of the lymphatic system.
- Lymph nodes
  - Tonsils

  - Spleen
  - Thymus
- Red bone marrow
- Lymph vessels

Standard 2
Describe how lymph is moved through the body.

Standard 3
Contrast antigens and antibodies.

Standard 4
Describe the general roles of lymphocytes (T-cells and B-cells) in the immune response.

Standard 5
Distinguish between types of immunity.
- Active immunity
- Passive immunity
- Natural immunity
- Artificial immunity

Standard 6
Explain the following diseases and disorders associated with the lymphatic system.
- Acquired immunodeficiency syndrome (AIDS)
- Measles
- Mumps
- Rubella
- Tetanus

STRAND 11
Students will **develop and use a model** to describe the structures and functions of the cardiovascular system.

Standard 1
List the general functions of the cardiovascular system.
- Transports nutrients and waste
- Transports heat
- Transports oxygen to body cells and carries carbon dioxide away from body cells
- Transports hormones to target tissues
- Transports antibodies

Standard 2
Identify the layers of the heart.
- Parietal pericardium
- Visceral pericardium
- Epicardium
- Myocardium
- Endocardium

Standard 3
Identify the chambers of the heart.

- Atria
- Ventricles

Standard 4
Identify the valves of the heart.
- Tricuspid/atrioventricular
- Pulmonary semilunar
- Bicuspid/atrioventricular (mitral)
- Aortic semilunar

Standard 5
Locate the great blood vessels of the heart.
- Superior vena cava
- Inferior vena cava
- Pulmonary trunk
- Pulmonary arteries
- Pulmonary veins
- Aorta
- Sections of the aorta
  - Ascending
  - Aortic arch
  - Descending

Standard 6
Trace blood flow through the heart.

Standard 7
Contrast pulmonary circulation and systemic circulation.

Standard 8
Identify the components of the conduction system of the heart and trace the pathway.
- Sinoatrial (SA) node
- Atrioventricular (AV) node
- AV bundle (Bundle of His)
- Bundle branches
- Purkinje fibers

Standard 9
Sequence the principal events of the cardiac cycle in terms of systole and diastole.

Standard 10
Define cardiac output (CO) and identify factors that influence it.
- Heart rate (HR)
- Stroke volume (SV)

Standard 11
Compare and contrast the structures and functions of arteries, capillaries, and veins.

Standard 12
Define pulse and identify the general location of arteries where pulse may be felt.

- Carotid - neck
- Radial – thumb side of wrist
- Brachial – medial antecubital fossa of arm

Standard 13
Describe blood pressure and explain the results.

Standard 14
Describe the following diseases and disorders of the cardiovascular system.
- Aneurysm
- Arteriosclerosis
- Atherosclerosis
- Cerebrovascular accident/stroke (CVA)
- Coronary artery disease
- Hypertension
- Murmur
- Myocardial infarction/heart attack (MI)

STRAND 12
Students will **construct an explanation** describing the structures and functions associated with the respiratory system.

Standard 1
Describe the general functions of the respiratory system.

Standard 2
Identify and sequence the organs of the respiratory system in the order which air will pass through them from the exterior.
- Nose/mouth
- Pharynx
  - Nasopharynx
  - Oropharynx
  - Laryngopharynx
- Larynx
- Trachea
- Bronchi
- Bronchioles
- Alveolar duct
- Alveoli

Standard 3
Identify the following structures associated with the larynx.
- Epiglottis
- Glottis
- Hyoid bone
- Thyroid cartilage
- Cricoid cartilage
- True vocal cords
- False vocal cords

Standard 4
Identify the coverings of the lungs and the gross anatomical features of the lungs.
- Apex
- Base
- Lobes
- Visceral pleura
- Parietal pleura
- Pleural cavity

Standard 5
Identify the volumes of air exchanged during ventilation.
- Tidal volume (TV)
- Inspiratory Reserve Volume (IRV)
- Expiratory Reserve Volume (ERV)
- Residual Volume (RV)

Standard 6
Differentiate between the following:
- Ventilation
- Respiration
  - External Respiration
  - Internal Respiration

Standard 7
Describe the effects of carbon dioxide (CO2) on ventilation.

Standard 8
Explain the following diseases and disorders of the respiratory system.
- Chronic Obstructive Pulmonary Disorder
  - Emphysema
  - Bronchitis
- Asthma
- Influenza
- Lung cancer
- Pneumonia
- Sudden Infant Death Syndrome (SIDS)
- Tuberculosis (TB)
- Cystic Fibrosis (CF)
- Respiratory Syncytial Virus (RSV)

STRAND 13
Students will **ask questions** to **construct an explanation** to describe the structures and functions associated with the digestive system.

Standard 1
Describe the general functions of the digestive system.
- Ingestion
- Digestion
- Absorption

- Excretion

Standard 2
Contrast chemical digestion and mechanical digestion.

Standard 3
Differentiate between the following:
- Alimentary canal structures
  - Mouth
  - Pharynx
  - Esophagus
  - Stomach
  - Small intestines
  - Large intestines
  - Rectum
  - Anus
- Accessory structures
  - Salivary glands (parotid)
  - Pancreas
  - Gallbladder
  - Liver

Standard 4
Describe the functions of saliva and salivary amylase in digestion.

Standard 5
Identify the following parts of a typical tooth.
- Crown
- Neck
- Root
- Gingiva
- Periodontal ligament
- Enamel
- Dentin
- Pulp
- Root canal

Standard 6
Define the following:
- Deglutition
- Mastication
- Maceration
- Segmentation
- Peristalsis
- Haustral churning

Standard 7
Identify the anatomical features of the stomach.
- Lower esophageal sphincter
- Fundus

- Body
- Rugae
- Pylorus
- Pyloric sphincter

Standard 8

Identify the basic components and functions of the creation of pepsin in gastric juices.

- Chief cells - pepsinogen
- Parietal cells – hydrochloric acid
- Goblet cells - mucus

Standard 9

Identify the location and digestive functions of the pancreas.

- Acini Cells – cluster or group of acinar cells arranged in a rounded structure responsible for synthesis and secretion of hydrolytic enzymes.

Standard 10

Describe the function of bile (emulsification).

Standard 11

Identify and describe the structures and functions of the three sections of the small intestine.

- Duodenum
- Jejunum
- Ileum

Standard 12

Identify and describe the structures and functions of the sections of the large intestine.

- Cecum
- Colon
  - Ascending colon
  - Transverse colon
  - Descending colon
  - Sigmoid colon
- Rectum
- Anal canal

Standard 13

Explain the following diseases and disorders of the digestive system.

- Appendicitis
- Cirrhosis
- Colorectal cancer
- Gallstones
- Hepatitis
- Lactose intolerance
- Ulcers
- Celiac disease
- Crohn's disease
- Irritable Bowel Syndrome (IBS)
- Gastroesophageal Reflux Disease (GERD)

STRAND 14

Students will **obtain, evaluate and communicate information** about the structures and functions associated with the urinary system.

Standard 1

Describe the general functions of the urinary system.

- Regulates the volume and composition of blood.
- Excretes body waste.

Standard 2

Identify the four major organs of the urinary system.

- Kidneys
- Ureters
- Bladder
- Urethra

Standard 3

Identify the gross anatomy of the kidney

- Renal capsule
- Renal cortex
- Renal medulla
- Renal pyramids
- Renal pelvis
- Calyces

Standard 4

Identify the microscopic structures of the nephron.

- Afferent arteriole
- Renal corpuscle
  - Glomerulus
  - Glomerular (Bowman's) capsule
- Efferent arteriole
- Renal tubule
  - Proximal convoluted tubule
  - Descending limb
  - Nephron loop (Loop of Henle)
  - Ascending limb
  - Distal convoluted tubule
  - Collecting duct
- Peritubular capillaries

Standard 5

Describe the three basic physiological processes and the structures involved in urine formation.

- Filtration
- Reabsorption
- Secretion

Standard 6

Identify abnormal constituents of urine and possible causes of each.

- Glucose
- Ketones in excessive levels
- Erythrocytes
- Leukocytes
- Bilirubin
- Microbes
- Albumin

Standard 7

Describe the methods of fluid intake and output.

- Intake
  - Oral
    - Liquid
    - Solid
  - Intravenous
  - Metabolic
- Output
  - Urination (micturition or voiding)
  - Sweat
  - Feces
  - Exhaled vapor

Standard 8

Explain the following diseases and disorders associated with the urinary system.

- Glomerulonephritis
- Incontinence
- Kidney stones
- Polyuria
- Renal failure
- Urinary tract infections (UTI)

STRAND 15

Students will **develop and use models** to describe the structures and functions associated with the reproductive system.

Standard 1

Describe the general functions of the reproductive system.

- Production of gametes (egg and sperm) by the gonads.
- Production of hormones to help in the maturation process.

Standard 2

Identify and describe the structures and functions of the male genitalia.

- External
  - Penis
  - Scrotum
  - Testes
- Internal
  - Epididymis
  - Ductus deferens (vas deferens)

    - Ejaculatory duct
    - Urethra
- Accessory
    - Seminal vesicles
    - Prostate
    - Bulbourethral gland (Cowper's gland)

Standard 3
Describe the functions of testosterone in the male.

Standard 4
Identify and describe the structures and functions of the female reproductive system.
- External
    - Vulva
    - Labia majora
    - Clitoris
    - Labia minora
    - Mons pubis
    - Vestibule
- Internal
    - Ovaries
    - Uterine tubes (Fallopian tubes)
        - Infundibulum and fimbriae
        - Ampulla
        - Isthmus
    - Uterus
    - Vagina
- Accessory
    - Mammary glands
    - Perineum

Standard 5
Describe the structures and functions of the uterus.
- Perimetrium
- Myometrium
- Endometrium
    - Stratum functionalis
    - Stratum basalis
- Fundus
- Cervix

Standard 6
Define the menstrual cycle including the ovarian cycle and uterine cycle and changes that occur during menopause.

Standard 7
Describe the physiological effects of estrogens, progesterone, and relaxin.

Standard 8
Contrast the general outcomes of spermatogenesis vs. oogenesis.

Standard 9

Explain the following sequence of events that occur during human development:

- Fertilization
- Zygote
- Implantation
- Embryo
- Fetus

Standard 10

Describe the principal events associated with the three stages of labor.

- Stage 1-dilation and effacement
- Stage 2-delivery and birth
- Stage 3-placental expulsion

Standard 11

Explain the following diseases and disorders of the reproductive system.

- Reproductive cancers
  - Breast cancer
  - Testicular cancer
  - Cervical cancer
  - Ovarian cancer
  - Prostate cancer
  - Uterine cancer
- Endometriosis
- Impotence
- Infertility
- Polycystic Ovarian Syndrome (POS)
- Sexually Transmitted Infections (STI)
  - Gonorrhea
  - Syphilis
  - Genital herpes
  - Chlamydia
  - Trichomoniasis
  - Genital warts
  - Human Papilloma Virus (HPV)

Performance Skills

- Students will explore careers in healthcare. Students will participate in a minimum of three career exploration experiences to investigate a variety of health care careers related to behavioral and mental health, community and social services, personal care services, physical health, and biotechnology research and development pathways. NOTE: Electronically delivered career exploration experiences are permissible.
- Students will provide an oral and/or written report for each career exploration.
- Students will select a topic and defend their position on a current medical ethics dilemma.

Durable Skills

- Professionalism
- Collaboration
- Communication

- Leadership
- Innovation
- Adaptability

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand															Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		

KEY VOCABULARY CLARIFICATIONS

Strand 1: Body Plan, Organization, and Homeostasis

Mediastinum: The central compartment of the thoracic cavity, containing the heart, bronchi, esophagus, and thymus.

Negative feedback: A mechanism that counteracts a change in the body to return it to a set point (e.g., regulating blood pressure or body temperature).

Positive feedback: A mechanism that amplifies a change in the body, moving it further from the set point (e.g., childbirth or blood clotting).

Strand 2: Body Chemistry

Cellular respiration: A series of chemical reactions by which cells convert glucose and oxygen into energy (ATP), carbon dioxide, and water.

Nucleic acids (RNA, DNA): Organic macromolecules that carry genetic information and are involved in protein synthesis.

Strand 3: Cells

Active transport (Sodium/Potassium pump): A process that uses energy to move substances across the cell membrane against their concentration gradient (e.g., the sodium-potassium pump).

Endocytosis (phagocytosis): The process by which cells take in substances by engulfing them in a vesicle. Phagocytosis is a type of endocytosis where the cell "eats" large particles.

Exocytosis: The process by which cells release substances by fusing vesicles with the cell membrane.

Strand 4: Histology and Integumentary System

Visceral (membrane): The layer of a serous membrane that covers an organ.

Parietal (membrane): The layer of a serous membrane that lines the wall of a cavity.

Serous membrane: A membrane that lines body cavities closed to the exterior and secretes serous fluid.

Strand 5: Skeletal System

Articulation (joint): Point where two or more bones meet.

Fibrous joint: An immovable joint where bones are joined by fibrous tissue.

Cartilaginous joint: A slightly movable joint where bones are joined by cartilage.

Synovial joint: A freely movable joint characterized by a joint cavity containing synovial fluid.

Synarthrotic joint: An immovable joint.

Amphiarthrotic joint: A slightly movable joint.

Diarthrotic joint: A freely movable joint.

Strand 6: Muscular System

Acetylcholine (ACh): A chemical messenger released at the neuromuscular junction that stimulates muscle contraction.

Sliding-filament theory: The explanation for how muscles contract, involving the sliding of actin filaments past myosin filaments.

Strand 7: Nervous System and Special Senses

Diencephalon: A region of the brain located above the brain stem, containing the thalamus and hypothalamus.

Neuroglial cells: Non-neuronal cells that support and protect neurons (e.g., astrocytes, microglia, oligodendrocytes, ependymal cells, Schwann cells, satellite cells).

Strand 8: Endocrine System
Myxedema: A severe form of hypothyroidism in adults, characterized by swelling and thickening of the skin.

Strand 9: Blood

Agranulocytes: A type of white blood cell that does not contain granules in their cytoplasm (e.g., monocytes, lymphocytes).

Basophils: A type of white blood cell involved in allergic reactions and inflammation.

Granulocytes: A type of white blood cell that contains granules in their cytoplasm (e.g., neutrophils, basophils, eosinophils).

Eosinophils: A type of white blood cell involved in allergic reactions and fighting parasitic infections.

Lymphocytes: A type of white blood cell that plays a key role in the immune system (T-cells and B-cells).

Monocytes: Large white blood cells that can transform into macrophages and engulf pathogens.

Neutrophils: The most common type of white blood cell, involved in fighting bacterial infections.

Strand 10: Lymphatic System

B-cells: A type of lymphocyte that produces antibodies.

T-cells: A type of lymphocyte that directly attacks infected cells or cancer cells.

Active immunity: Immunity developed by an individual's own immune system in response to an infection or vaccination.

Artificial immunity: Immunity acquired through medical intervention, such as vaccination or receiving antitoxins.

Natural immunity: Immunity acquired through natural exposure to a pathogen or through maternal antibodies.

Passive immunity: Immunity acquired by receiving antibodies from another source (e.g., from mother to baby or through an injection).

Strand 11: Cardiovascular System

Endocardium: The innermost layer of the heart wall, lining the chambers and valves.

Myocardium: The middle, muscular layer of the heart wall, responsible for pumping blood.

Parietal pericardium: The outer layer of the pericardium, a sac that surrounds the heart.

Visceral pericardium (Epicardium): The inner layer of the pericardium, which is also the outermost layer of the heart wall.

Strand 12: Respiratory System

Parietal pleura: The outer layer of the pleura, lining the chest wall.

Expiratory Reserve Volume (ERV): The extra amount of air that can be exhaled after a normal breath.

Inspiratory Reserve Volume (IRV): The extra amount of air that can be inhaled after a normal breath.

Residual Volume (RV): The amount of air remaining in the lungs after a maximal exhalation.

Tidal volume (TV): The amount of air inhaled or exhaled during normal, quiet breathing.

Visceral pleura: The inner layer of the pleura, covering the surface of the lungs.

Strand 13: Digestive System

Accessory structures (of digestion): Organs that aid in digestion but are not part of the alimentary canal (e.g., salivary glands, pancreas, gallbladder, liver).

Alimentary canal (Gastrointestinal [GI] tract): The continuous tube that extends from the mouth to the anus, through which food passes.

Emulsification: The process of breaking down large fat globules into smaller ones, aided by bile.

Haustral churning: Slow, segmental movements in the large intestine that mix the contents.

Segmentation: Localized contractions of the small intestine that mix food with digestive juices.

Strand 14: Urinary System

Glomerulonephritis: Inflammation of the glomeruli in the kidneys.

Strand 15: Reproductive System

Endometrium: The innermost lining of the uterus, which thickens during the menstrual cycle and is shed if pregnancy does not occur.

Myometrium: The middle, muscular layer of the uterine wall, responsible for contractions during childbirth.

Oogenesis: The process of egg cell production in females.

Stratum functionalis: The superficial layer of the endometrium that is shed during menstruation.

Stratum basalis: The deeper layer of the endometrium that remains after menstruation and regenerates the functionalis layer.

STRANDS AND STANDARDS

MEDICAL ANATOMY AND PHYSIOLOGY, ADVANCED

Course Description

An Advanced Medical Anatomy and Physiology course. This course is a college level Anatomy & Physiology course that teaches in-depth body structures and functions preparatory for further healthcare training programs or careers.

Intended Grade Level	12
Units of Credit	2.0
Core Code	36.01.00.00.115
Concurrent Enrollment Core Code	36.01.00.13.115
Prerequisite	Medical Anatomy & Physiology
Skill Certification Test Number	703
Test Weight	1.0
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Medical Anatomy & Physiology
Endorsement 2	N/A
Endorsement 3	N/A

Updated: July 2025

STRAND 1

Students will **develop and utilize models** to describe the body plan, organization, and a stable internal environment (homeostasis).

Standard 1

Contrast the sciences of anatomy and physiology.

Standard 2

Describe the six levels of structural organization of the human body and their interrelationship.

- Chemical
- Cellular
- Tissue
- Organ
- System
- Organism

Standard 3

Define anatomical position and identify commonly used planes in gross anatomy and/or imaging.

- Sagittal
  - Midsagittal
  - Parasagittal
- Transverse (horizontal)
- Frontal (coronal)
- Oblique

Standard 4

Apply directional terms used in human anatomy.

- Posterior/Anterior
- Medial/Lateral
- Proximal/Distal
- Superficial/Deep
- Superior/Inferior
- Cranial/Caudal
- Ventral/Dorsal
- Ipsilateral/Contralateral
- Parietal/Visceral

Standard 5

Apply regional terms used in human anatomy.

- Head (cephalic)
  - Skull (cranial)
  - Base of skull (occipital)
- Face (facial)
  - Forehead (frontal)
  - Temple (temporal)
  - Eye (orbital, ocular)
  - Ear (otic)
  - Cheek (buccal)
  - Nose (nasal)

    - Mouth (oral)
    - Chin (mental)
- Neck (cervical)
- Spinal column (vertebral)
- Trunk
    - Chest (thoracic)
        - Breastbone (sternal)
        - Breast (mammary)
        - Shoulder blade (scapular)
        - Back (dorsal)
    - Abdomen (abdominal)
        - Navel (umbilical)
        - Hip (coxal)
        - Loin (lumbar)
        - Between hips (sacral)
    - Pelvis (pelvic)
        - Groin (inguinal)
        - Pubis (pubic)
        - Buttock (gluteal)
        - Perineal
- Upper Extremity
    - Armpit (axillary)
    - Arm (brachial)
    - Front of elbow (antecubital)
    - Back of elbow (olecranal, cubital)
    - Forearm (antebrachial)
    - Wrist (carpal)
    - Hand (manual)
        - Thumb (pollux)
        - Palm (palmar, volar)
        - Back of hand (dorsum)
        - Fingers (digital, phalangeal)
- Lower Extremity
    - Thigh (femoral
    - Knee
        - Anterior surface (patellar)
        - Posterior surface (popliteal)
    - Leg (crural)
        - Calf (sural)
    - Foot (pedal)
        - Ankle (tarsal)
        - Sole (plantar)
        - Top of foot (dorsum)
        - Heel (calcaneal)
        - Toes (digital, phalangeal)
        - Great toe (hallux)

Standard 6

Identify the body cavities and locate the following organs within each cavity.

- Dorsal Cavity
  - Vertebral (spinal) -spinal cord
  - Cranial-brain
- Ventral Cavity
  - Thoracic
    - Mediastinum-heart, bronchi, esophagus, thymus.
    - Pericardial-heart
    - Pleural-lungs
- Abdominopelvic Cavity
  - Abdominal-liver, spleen, intestines, kidneys, stomach, pancreas
  - Pelvic-intestines, urinary bladder, sex organs

Standard 7

Identify the four abdominopelvic quadrants and the nine abdominopelvic regions and locate the major organ(s) in each.

- Quadrants
  - RUQ-right upper quadrant-liver, gallbladder, right kidney
  - RLQ-right lower quadrant-cecum, appendix, right ovary
  - LUQ-left upper quadrant-spleen, stomach, pancreas, left kidney.
  - LLQ-lower left quadrant-left ovary
- Regions
  - Right/Left hypochondriac
  - Right/Left lumbar
  - Right/Left inguinal (iliac)
  - Epigastric
  - Umbilical
  - Hypogastric (pubic)

Standard 8

Define and describe the mechanism of homeostasis.

- Receptors
- Control centers
- Effectors

Standard 9

Compare and contrast negative and positive feedback mechanisms to maintain homeostasis. Give examples of each.

- Positive feedback (induce or stimulates)
  - Examples:
    - childbirth
    - breast feeding
    - blood clotting
    - severe bleeding
- Negative feedback (inhibits or reverses)
  - Examples:
    - blood pressure
    - blood glucose
    - thermoregulation
    - water balance (thirst)

STRAND 2

Students will **construct an explanation** of the basic principles of body chemistry (matter, structure, and function).

Standard 1

Review the following terms and concepts.

- States of Matter
- Elements
- Basic components of the atom
  - Nucleus
  - Electrons
  - Protons
  - Neutrons
- Metabolism
  - Anabolic
  - Catabolic

Standard 2

Identify the major, lesser, and trace elements in the body and their chemical symbols.

- Major
  - Carbon (C)
  - Hydrogen (H)
  - Oxygen (O)
  - Nitrogen (N)
- Lesser
  - Sodium (Na)
  - Chlorine (Cl)
  - Potassium (K)
  - Calcium (Ca)
- Trace
  - Helium (He)
  - Lithium (Li)
  - Beryllium (Be)
  - Boron (B)
  - Fluorine (Fl)
  - Neon (Ne)
  - Magnesium (Mg)
  - Aluminum (Al)
  - Silicon (Si)
  - Phosphorus (P)
  - Sulfur (S)
  - Argon (Ar)
  - Iron (Fe)
  - Selenium (Se)
  - Bromine (Br)
  - Krypton (Kr)
  - Iodine (I)
  - Xenon (Xe)

Standard 3
Differentiate between atomic number, mass number, and atomic mass using the periodic table.

Standard 4
Define isotope and distinguish between stable isotopes and radioisotopes.

Standard 5
Define valence and electronegativity, and describe how they relate to the position of an element on the periodic table.

Standard 6
Describe the characteristics and strength of different chemical bonds.

- Ionic (cation, anion)
- Covalent
  - Non-polar
    - Single
    - Double
    - Triple
  - Polar
- Hydrogen

Standard 7
Describe the properties of water and how it is utilized in the human body.

- Universal solvent
- Transport
- Lubricant
- Heat capacity
- Chemical reactions

Standard 8
Define acid, and base, and describe the pH scale.

- Acidic
  - Hydrogen (proton) donor
- Basic (alkaline)
  - Hydrogen (proton) acceptor
- Neutral
- Blood ph = 7.35 to 7.45

Standard 9
Define a pH buffer and explain the role of the carbonic acid/bicarbonate buffer system.
$H_2O + CO_2 <---> H_2CO_3 <---> H^+ + HCO_3^-$

STRAND 3
Students will **construct an explanation** of the basic principles of inorganic/organic body chemistry (matter, structure, and function).

Standard 1
Distinguish between:

- Inorganic compounds-do not contain carbon, small molecules, usually form ionic bonds

- Organic compounds-usually contain carbon, large molecules, form covalent bonds, flammable

Standard 2

Compare and contrast how anabolic and catabolic processes form monomers and polymers.

- Dehydration synthesis
- Hydrolysis

Standard 3

Describe the naming, structure, and functions of carbohydrates and give an example of each:

- Monosaccharides (monomer)
  - Hexose
    - Glucose
    - Fructose
    - Galactose
  - Pentose
    - Deoxyribose
    - Ribose
- Disaccharides
  - Sucrose (glucose + fructose)
  - Lactose (glucose + galactose)
  - Maltose (glucose + glucose)
- Polysaccharides (polymer)
  - Glycogen
  - Amylose - starch
  - Cellulose - fiber

Standard 4

Describe the naming, structures, and functions of proteins and give an example of each:

- Amino Acids (monomer)
    - Carboxyl
    - R-Group (20 unique groups)
    - Amino group
- Bonds
  - Peptide
  - Dipeptide
  - Polypeptide
- Levels of protein structure
  - Primary
  - Secondary
  - Tertiary
  - Quarternary
- Enzymes

Standard 5

Describe the structures and functions of lipids and give an example of each:

- Fatty acids (monomer)
  - Saturated
  - Unsaturated
    - Monounsaturated

    - Polyunsaturated
- Triglycerides
- Steroids

Standard 6

Describe the structures and functions of nucleic acids and give an example of each:

- Nitrogenous Bases
    - Adenine
    - Guanine
    - Thymine
    - Cytosine
    - Uracil
- Nucleotide (monomer) = base + sugar + phosphate
- RNA and DNA (polymer)

Standard 7

Describe the structure and function of phospholipids.

Standard 8

Describe the structure and function of glycolipids and glycoproteins as cell surface markers.

STRAND 4

Students will **construct and develop** models to describe basic structures and functions of cells.

Standard 1

Identify the principal parts of a generalized animal cell and their functions.

- Nucleus
    - Nucleoulus
    - Chromosome
        - Chromatin
        - Gene (DNA, RNA)
- Cytoplasm
    - Cytosol
    - Organelles
        - Ribosome
        - Endoplasmic Reticulum (smooth, rough)
        - Golgi complex (body)
        - Lysosome
        - Mitochondria
        - Centrosome (centrioles)
        - Cytoskeleton
        - Cilia
        - Flagella
        - Peroxisome
- Cell membrane
    - Phospholipids
    - Cholesterol
    - Glycoproteins
    - Glycolipids

- Protein channels

Standard 2
Describe a selectively permeable membrane and factors which influence permeability.

Standard 3
Contrast intracellular and extracellular fluid in terms of location and composition.

Standard 4
Describe each of the following cellular transport processes and classify them as active or passive.

- Passive processes
  - Simple diffusion
  - Facilitated diffusion
  - Filtration (dialysis)
  - Osmosis
- Active processes
  - Endocytosis
    - Phagocytosis
    - Pinocytosis
    - Receptor mediated
  - Exocytosis
  - Secondary Active Transport
    - Antiport
    - Symport
  - Sodium/Potassium pump

Standard 5
Compare and contrast the osmotic effects that occur when a cell is placed in the following solutions:

- Isotonic
- Hypotonic
- Hypertonic

Standard 6
Describe how and where the body produces energy during cellular respiration.

ATP ADP + P + ENERGY

- Glycolysis (anaerobic)
- Formation of acetyl coenzyme A/lactic acid (aerobic vs anaerobic pathways)
- Citric Acid Cycle (Krebs)
- Electron Transport Chain

Standard 7
Sequence the steps of the cell cycle. Compare and contrast mitosis and meiosis.

- Interphase
  - G0
  - G1
  - S
  - G2
- Mitosis
  - Prophase
  - Metaphase

    - Anaphase
    - Telophase
    - Cytokinesis
- Meiosis
    - Prophase I & II
    - Metaphase I & II
    - Anaphase I & II
    - Telophase I & II
    - Cytokinesis

Standard 8
Describe the process of transcription and translation in relationship to protein synthesis.

Standard 9
Describe the process of DNA replication.

STRAND 5
Students will **plan and carry out an investigation** to compare and contrast the basic structures and functions of tissues.

Standard 1
Identify and describe the general characteristics and functions of each of the four principal types of tissues.
- Epithelial
- Connective
- Muscular
- Nervous

Standard 2
Describe the naming, structural features, and locations of epithelial tissue.
- Structural features
    - Apical surface
    - Basal surface
    - Basement membrane
    - Avascular
- Naming conventions
    - Arrangement of cells
        - Simple
        - Stratified
        - Psuedostratified
    - Cell Shape
        - Squamous
        - Cuboidal
        - Columnar
        - Transitional
- Glandular epithelium
    - Exocrine glands
    - Endocrine glands

Standard 3

Describe the structural features, types, and locations of connective tissue.

- Cells
- Extracellular matrix
  - Fibers
  - Ground substance
- Types of connective tissue
  - Loose
    - Areolar
    - Adipose
    - Reticular
  - Dense
    - Regular
    - Irregular
    - Elastic
  - Cartilage
    - Hyaline
    - Fibrocartilage
    - Elastic
  - Blood
  - Bone
  - Lymph

Standard 4

Describe the five main types of cellular junctions.

- Tight
- Gap
- Adherens
- Desmosomes
- Hemidesmosomes

Standard 5

Compare and contrast epithelial and connective tissue membranes.

- Cutaneous
- Serous
- Mucous
- Synovial – connective only

Standard 6

Compare and contrast skeletal, cardiac, and smooth muscle tissue.

- Voluntary vs. involuntary
- Striated vs. non-striated
- Location and number of nuclei

Standard 7

Describe and identify the key features of nervous tissue.

- Neuron
- Glial cells

STRAND 6

Students will **plan and carry out an investigation** to compare and contrast the basic structures and functions of the integumentary system.

Standard 1

Describe the general structures and functions of the integumentary system.

Standard 2

Identify and describe the tissue types of the epidermis. Identify and describe layers of the epidermis. Differentiate between thick and thin skin. Describe renewal of the epidermis.

Standard 3

Explain how each cell type (stem cells, keratinocytes, melanocytes, Langerhans cells, Merkel cells and discs) and substances (keratin, extracellular lipids) contribute to the function of the epidermis.

Standard 4

Identify and describe the dermis and its layers. Know the tissue types of each layer.

Standard 5

Identify and describe the hypodermis/subcutaneous layer. Know the tissue types of the hypodermis.

Standard 6

Identify exocrine glands of the integumentary system and describe their function.

- Sudoriferous
  - Eccrine
  - Apocrine
- Sebaceous
- Ceruminous

Standard 7

Identify nerve endings of the integumentary system and describe their functions.

- Meissner's corpuscles
- Merkel disk
- Free nerve endings
- Pacinian corpuscles
- Ruffini ending

Standard 8

Describe the structures and functions of accessory structures of the integumentary system.

- Hair
- Nails

Standard 9

Explain the role of skin in the maintenance of body temperature (thermoregulation).

STRAND 7

Students will **develop and use models** to relate the structure of the skeletal system to its functional role in movement, protection, and support.

Standard 1

Describe the general functions of the skeletal system.

Standard 2

List the cellular components of bone tissue. List the extracellular components of bone tissue.

- Cells
  - Osteogenic
  - Osteoblasts
  - Osteocytes
  - Osteoclasts
- Extracellular matrix
  - Organic (ex. collagen)
  - Inorganic (ex. hydroxyapatite)

Standard 3

Compare and contrast compact and spongy bone.

Standard 4

Describe the roles and location of the following skeletal connective tissues:

- Dense regular
  - Ligaments
  - Tendons
- Dense irregular
  - Periosteum
  - Endosteum
- Cartilage
  - Hyaline (articular)
  - Fibrocartilage
  - Elastic

Standard 5

Identify the features of a long bone.

- Periosteum
- Diaphysis
- Metaphysis
- Epiphysis
- Epiphyseal plate/line (growth plate)
- Medullary cavity
- Red marrow
- Yellow marrow
- Articular cartilage
- Endosteum
- Compact bone
- Spongy bone

Standard 6
Compare and contrast endochondral and intramembranous ossification.

Standard 7
Explain how hormones are involved in bone growth and maintenance. Explain how hypercalcemia and hypocalcemia cause the release of calcitonin, parathyroid hormone and calcitriol in regulation of bone remodeling and blood calcium.

Standard 8
Define and locate bone markings including:
- Condyle
- Epicondyle
- Facet
- Fissure
- Foramen
- Fossa
- Head
- Meatus
- Process
- Spine
- Sulcus
- Trochanter
- Trochlea
- Tubercle
- Tuberosity

Standard 9
Locate the following bones of the axial and appendicular skeletons.
- Axial Skeleton
  - Mandible
  - Maxilla
  - Zygomatic
  - Frontal
  - Parietal
  - Occipital
  - Sphenoid
  - Ethmoid
  - Hyoid
  - Temporal
  - Vertebrae (lamina, body, pedicle, spinous process, transverse process)
    - Cervical
    - Thoracic
    - Lumbar
    - Sacral
    - Coccygeal
  - Ribs
  - Sternum
- Appendicular Skeleton
  - Clavicle

- Scapula
- Pubic bone
- Ilium
- Ischium
- Pubis
- Femur
- Patella
- Tibia
- Fibula
- Tarsals
- Metatarsals
- Phalanges
- Humerus
- Ulna
- Radius
- Carpals
- Metacarpals
- Phalanges

Standard 10

Compare and contrast functional and anatomical (structural) classification of joints.

- Structural:
  - Fibrous
  - Synovial
  - Cartilaginous
- Functional:
  - Amphiarthrotic
  - Diarthrotic
  - Synarthrotic

Standard 11

Describe the different movements of a joint.

- Flexion/extension/hyperextension
- Abduction/adduction/circumduction
- Pronation/supination
- Internal (medial) and external (lateral) rotation
- Plantarflexion/dorsiflexion

STRAND 8

Students will **develop and use models** to relate the structure of the muscular system to its functional role in movement, protection, and support.

Standard 1

Describe the general functions of the muscular system.

Standard 2

Contrast the general location, microscopic appearance, control, and functions of the three specific types of muscle tissue.

- Skeletal

- Smooth
- Cardiac

Standard 3

Describe muscle organization and structure.

- Sarcomere
- Myofibril
- Muscle cell (muscle fiber)
- Sarcolemma
- Sarcoplasm
- Transverse tubules (T-tubules)
- Sarcoplasmic reticulum
- Triad
- Fascicle
- Endomysium
- Perimysium
- Epimysium

Standard 4

Describe the structures of the sarcomere.

- Myofilaments
  - Actin (thin)
    - Troponin
    - Tropomyosin
  - Myosin (thick)
- Bands and zones
  - A-band
  - I-band
  - Z-disc
  - H-zone
  - M-line

Standard 5

Label the components of the neuromuscular junction on a diagram and explain the role in triggering muscle contraction.

Standard 6

List the sequence of events from muscle cell action potential to the contraction of muscle.

- Nerve impulse (action potential)
- Acetylcholine (Ach) - neurotransmitter
- Muscle contraction stimulated

Standard 7

Describe the sliding filament model of muscle contraction.

Standard 8

Explain the role of other molecules like creatine and myoglobin in energy metabolism.

Standard 9

Define and describe the terms origin, insertion, action, prime mover, agonist, antagonist, synergist, and fixator.

Standard 10

Explain how the following terms are used to name muscles and provide an example of each:

- Location
- Shape
- Size
- Number of origins
- Direction of fibers
- Origin and insertion
- Action

Standard 11

Identify the following muscles including their location, origin/insertion, and action.

- Upper Extremity
  - Rotator cuff
    - Supraspinatus
    - Infraspinatus
    - Teres minor
    - Subscapularis
  - Deltoid
  - Pectoralis Major
  - Latissimus Dorsi
  - Triceps Brachii
  - Biceps Brachii
  - Brachialis
  - Brachioradialis
  - Wrist flexors
  - Wrist extensors
- Lower Extremity
  - Iliopsoas
  - Gluteus Maximus
  - Gluteus Medius
  - Sartorius
  - Hip adductors
  - Quadriceps
    - Rectus femoris
    - Vastus medialis
    - Vastus lateralis
    - Vastus intermedius
  - Hamstrings
    - Biceps femoris
    - Semimembranosus
    - Semitendinosus
  - Gastrocnemius
  - Soleus
  - Tibialis Anterior
  - Tibialis Posterior
  - Peroneal (fiblular) group
- Head/neck/Trunk
  - Masseter

- Sternocleidomastoid
- Trapezius
- Diaphragm
- Intercostals
- Rectus Abdominus
- Internal/External Oblique
- Transverse Abdominus
- Erector Spinae

STRAND 9

Students will **develop and use models** to relate the structure of the nervous system and its functional roles in detection, interpretation and response to information.

Standard 1

Distinguish between the sensory and motor (somatic and autonomic) divisions of the nervous system and the terminology associated

- Ganglion vs nuclei
- Tracts vs nerves
- Gyrus vs sulcus vs fissure

Standard 2

Compare and contrast characteristics of the two cell types of the nervous system: neurons and glial cells.

- Neurons
  - Cell body
  - Axon
  - Dendrite
- Glial Cells
  - Central Nervous System (CNS)
    - Astrocytes
    - Microglia
    - Oligodendrocytes
    - Ependymal cells
  - Peripheral Nervous System (PNS)
    - Schwann cells
    - Satellite cells

Standard 3

Compare and contrast concentration gradient and electrical forces. Apply these principles to the movement of ions across the cell membrane.

Standard 4

List and describe the sequence of events in the action potential. Label a diagram of the action potential including: threshold, depolarization, repolarization, hyperpolarization, and absolute and relative refractory periods.

Standard 5

List and describe in order the sequence of events at the synapse. Begin with the arrival of the action potential and end with the effect of neurotransmission on the postsynaptic cell.

- Action potential arrival at presynaptic cell

- Neurotransmitter release into synaptic space
- Neurotransmitter binds with post synaptic receptor causing a biochemical change

Standard 6

Identify the following neurotransmitters:

- Acetylcholine (ACh)
- Dopamine
- Serotonin
- Epinephrine
- Norepinephrine

Standard 7

Compare and contrast the effects of graded potentials (Excitatory Post Synaptic Potential [EPSP] and Inhibitory Post Synaptic Potential [IPSP]) on action potentials.

Standard 8

Describe the gross anatomy of the spinal cord and spinal nerves.

- Differentiate between gray and white matter.
- Understand the relationship of the spinal cord and spinal nerves to the bony vertebrae surrounding them.
- Label on a diagram the following structures associated with the spinal cord:
  - Lateral corticospinal tract
  - Posterior column
  - Spinothalamic tract
  - Dorsal/lateral/ventral horns
  - Dorsal root ganglia
  - Dorsal/ventral roots
  - Spinal nerves

Standard 9

Identify and describe the structures and functions of the brain.

- Cerebrum
  - Frontal
    - Pre-central gyrus (motor homunculus)
  - Parietal
    - Post-central gyrus (sensory homunculus)
  - Temporal
  - Occipital
- Cerebellum
- Brain stem
  - Medulla oblongata
  - Pons
  - Midbrain
- Diencephalon
  - Thalamus
  - Hypothalamus
- Gray/white matter organization
- Brain Landmarks
  - Fissures

    - Medial Longitudinal
    - Lateral
    - Transverse
- Gyri
    - Pre-central
    - Post-central
- Sulci
    - Central
    - Parieto-occipital
- Other
    - Corpus Collosum
    - Limbic System

Standard 10
Describe the anatomy and physiology of the sympathetic nervous system. In the description of the anatomy, include the location and length of preganglionic and postganglionic neurons and synapses. In the description of the physiology, include the activity of various organs innervated by the autonomic nervous system.

Standard 11
Describe the anatomy and physiology of the parasympathetic nervous system. In the description of the anatomy, include the location and length of preganglionic and postganglionic neurons and synapses. In the description of the physiology, include the activity of various organs innervated by the autonomic nervous system.

Standard 12
Identify the effectors of the autonomic nervous system. Identify the effectors of the somatic nervous system. Compare and contrast these.

Standard 13
Identify the three meninges. For each meninx, be able to describe its anatomical relationship to the skull, to the brain, and to the other meninges.
- Dura Mater
- Arachnoid
- Pia Mater

Standard 14
Describe cerebrospinal fluid. Identify locations where it is made; where it circulates; and where it is resorbed into the bloodstream.
- Choroid plexus
- Lateral Ventricles (2)
- Third Ventricle
- Aqueduct
- Fourth Ventricle
- Subarachnoid space
- Arachnoid villi

Standard 15
Describe the structure and function of the blood-brain barrier.

Standard 16

List the twelve cranial nerves. Correctly identify and associate their names and numbers. State a function for each and whether it is sensory, motor, or mixed.

- I- Olfactory
- II – Optic
- III- Oculomotor
- IV – Trochlear
- V- Trigeminal
- VI – Abducens
- VII – Facial
- VIII – Vestibulocochlear (acoustic)
- IX – Glossopharyngeal
- X- Vagus
- XI – Accessory (spinal)
- XII - Hypoglossal

Standard 17

Compare and contrast upper and lower motor neurons and. Describe the motor systems and pathways.

- Pre-central gyrus
- Pyramids
- Lateral corticospinal tract
- Effector

Standard 18

Identify the general features of a sensory system.

- Define transduction.
- Describe the sensory pathways for pain and temperature vs touch.
  - Pain and temperature
    - Receptor
    - Sensory nerve
    - Dorsal root ganglion
    - Dorsal horn
    - Lateral spinothalamic tract (crosses in spinal cord)
    - Thalamus
    - Post-central gyrus
  - Touch
    - Receptor
    - Sensory nerve
    - Dorsal root ganglion
    - Dorsal horn
    - Posterior column
    - Crosses in the medulla
    - Thalamus
    - Post-central gyrus

Standard 19

Define each of the following three categories of sensory receptors:

- Exteroceptor
- Interoceptor

- Proprioceptor

Standard 20
Compare and contrast the following sensory receptors:
- Mechanoreceptors
- Thermoreceptors
- Nociceptors
- Photoreceptors
- Chemoreceptors
- Osmoreceptors

Standard 21
Investigate dermatomes and their importance to nerve injury.
Examples:
- C6 – thumb
- T4- nipple line
- T10- umbilicus
- L2-L5 – lower limbs

STRAND 10
Students will **construct an explanation** about the cause-and-effect relationship of the reflex arc and special senses related to the detection, interpretation, and response to information.

Standard 1
Explain the role of each of the components of a reflex arc.
- Reflex arc
  - Receptor
  - Sensory neuron
  - Association (interneuron) neuron
  - Motor neuron
  - Effector

Standard 2
Describe examples of common reflexes
- Stretch reflex
- Flexor (withdrawal) reflex
- Cross extensor reflex

Standard 3
Label the components of the eye and describe the neural pathway to the brain.
- Accessory structures
  - Eyelid
  - Conjunctiva
  - Lacrimal apparatus
  - Extrinsic muscles
- Layers of the eyeball
  - Fibrous tunic
    - Sclera
    - Cornea

- Vascular tunic
  - Choroid
  - Ciliary body
  - Iris
  - Lens
  - Pupil
- Nervous tunic
  - Retina
  - Rods
  - Cones
- Neural pathway
  - Photoreceptor
  - Optic nerve
  - Optic chiasm
  - Thalamus
  - Occipital lobe

Standard 4

Explain the location and function of olfactory receptors. Describe the neural pathway to the brain.

- Olfactory receptors
- Olfactory nerve
- Olfactory bulb
- Olfactory tract
- Olfactory cortex of the temporal lobe

Standard 5

Explain the location and function of gustatory receptors. Describe the neural pathway to the brain.

- Gustatory receptors
  - Fungiform papillae
  - Foliate papillae
  - Vallate papillae
- Cranial nerve VII, IX, X
- Medulla
- Thalamus
- Post-central gyrus

Standard 6

Identify the principal anatomical structures of the ear, follow the sound conduction pathway from the auricle to the fluids of the inner ear, and describe the neural pathway to the brain.

- Outer ear
  - Auricle
  - Auditory Canal
- Middle ear
  - Tympanic cavity
  - Tympanic membrane
  - Auditory (Eustachian) tube
  - Auditory ossicles
    - Malleus
    - Incus

    - Stapes
- Inner ear
    - Oval window
    - Round window
    - Bony labyrinth
    - Utricle
    - Saccule
    - Semicircular canals
    - Vestibule
    - Cochlea & Organ of Corti
    - Vestibular duct (scala vestibuli)
    - Tympanic duct (scala tympani)
- Neural Pathway Receptors (hair cells)
- Cranial nerve VIII
- Medulla
- Thalmus
- Temporal lobe

Standard 7
Explain the coding of pitch and loudness in the auditory system.

Standard 8
For the vestibular system, compare and contrast static vs. dynamic equilibrium. Describe the neural pathway to the brain.
- Receptors (hair cells)
- Cranial nerve VIII
- Medulla
- Thalamus
- Somatosensory cortex

STRAND 11
Students will **investigate and analyze** how the hormones of the *endocrine* system regulate (effect) physical and chemical processes to maintain homeostasis.

Standard 1
Describe the functions of the endocrine system.

Standard 2
Describe and analyze the following endocrine terminology and concepts.
- Hormone
- Target cells
    - Autocrine
    - Paracrine
    - Endocrine
- Permissive, synergistic, and antagonistic effects
- Water soluble vs lipid soluble
- Target cell response
    - Up regulation
    - Down regulation

- Primary vs secondary endocrine glands

Standard 3

Diagram the location, secretion, and functions of the hypothalamus.

- Growth Hormone Releasing Hormone (GHRH)-targets anterior pituitary
- Thyrotropin Releasing Hormone (TRH)-targets anterior pituitary
- Corticotropic Releasing Hormone (CRH)-targets anterior pituitary
- Gonadotropic Releasing Hormone (GnRH) – targets anterior pituitary
- Prolactin Releasing Hormone (PRL) – targets anterior pituitary
- Antidiuretic Hormone (ADH)
  - Produced in hypothalamus
  - Stored in and released from the posterior pituitary
- Oxytocin Hormone (Oxt)
  - Produced in hypothalamus
  - Stored in and released from the posterior pituitary

Standard 4

Diagram the location, secretion, and functions of the pituitary gland.

- Anterior Pituitary (adenohypophysis)
  - Human Growth Hormone (GH) - Targets cells stimulating growth
  - Thyroid Stimulating Hormone (TSH) -Targets thyroid gland
  - Adrenocorticotropic Hormone (ACTH) - Targets adrenal cortex
  - Follicle Stimulating Hormone (FSH) - Targets gonads for gamete production
  - Luteinizing Hormone (LH) - Targets gonads, ovulation
  - Prolactin (PRL) - Targets mammary glands
  - Melanocyte Stimulating Hormone (MSH) - Targets melanocytes
- Posterior Pituitary (neurohypophysis)
  - Antidiuretic Hormone (ADH) - Targets kidneys, sudoriferous glands, smooth muscle of blood vessels.
  - Oxytocin (Oxt) - Targets uterus and breasts

Standard 5

Describe the anatomical and physiological relationships between the pituitary (which includes the adenohypophysis and the neurohypophysis) and the hypothalamus.

Standard 6

Describe the location and structures of the thyroid gland. List the hormones produced and target cells. Detail the synthesis and secretion of thyroid hormones.

- Structures
  - Follicle cells
  - Parafollicular cells
  - Thyroid follicle
  - Isthmus
- Hormones
  - Thyroxine (T4)
    - Follicular cells
    - Targets cells increasing metabolism
  - Triiodothyronine (T3)
    - Follicular cells
    - Targets cells increasing metabolism

- Calcitonin
  - Parafollicular cells
  - Lowers blood calcium

Standard 7

Describe the location, secretion, and functions of the parathyroid gland.

- Parathyroid hormone
- Chief cells
- Increases blood calcium

Standard 8

Describe the antagonistic relationship between calcitonin and parathyroid hormone in regulating blood calcium.

Standard 9

Describe the location and structures of the adrenal gland. List the hormones produced and target cells.

- Adrenal cortex
  - Zona glomerulosa – mineralocorticoids – aldosterone
  - Zona fasciculata – glucocorticoids – cortisol
  - Zona reticularis- gonadocorticoids - androgens
- Adrenal medulla
  - *Catacholamines*
    - Epinephrine
    - Norepinephrine

Standard 10

Describe the renin-angiotensin-aldosterone system (RAAS) and its role in regulating blood pressure.

Standard 11

Describe the location and structures of the pancreas. List the hormones produced and their functions. Describe the antagonistic relationship between glucagon and insulin in regulating blood glucose.

- Structures
  - Head
  - Body
  - Tail
  - Pancreatic Acini – exocrine – digestive function
- Pancreatic Islets
  - Alpha – glucagon – increases glucose levels
  - Beta – insulin – decreases glucose levels

Standard 12

Describe the location, secretion, and functions of the pineal gland.

- Melatonin – regulates sleep/wake cycle

Standard 13

Describe the location, secretion, and functions of the thymus gland.

- Thymosin: T-lymphocyte maturation

Standard 14

Describe the location, secretion, and functions of the gonads.

- Ovaries: estrogen, progesterone
- Testes: testosterone

STRAND 12

Students will **obtain, evaluate and communicate information** that explains the structure and functions of whole blood components, including the lymphatic system and the effects on immunity.

Standard 1

Identify and describe the components of whole blood.

- Erythrocytes
- Leukocytes
- Thrombocytes (platelets)
- Plasma
  - Water
  - Proteins
  - Nutrients
  - Hormones

Standard 2

Describe hematopoiesis including erythropoiesis.

Standard 3

Describe the structure and function of the red blood cells (RBCs).

- Physical characteristics
- Hemoglobin
- Hematocrit
- Antigens
  - ABO
  - Rh

Standard 4

Define leukocyte and identify the various types of white blood cells normally present in the blood.

- Leukocytes
  - Granulocytes
    - Neutrophils
    - Basophils
    - Eosinophils
  - Agranulocytes
    - Monocytes
    - Lymphocytes
      - B-cells
      - T-cells

Standard 5

Identify the production and functions of thrombocytes.

Standard 6

Define hemostasis and describe the three mechanisms that contribute to hemostasis. Describe *fibrinolysis*.

- Vascular spasm

- Platelet plug formation
- Coagulation
  - Intrinsic
  - Extrinsic
  - Common final pathway
- Anti-coagulation (fibrinolysis)

Standard 7

Describe the structures and functions of the lymphatic system. Explain how lymph is formed and how it circulates.

- Structures
  - Primary lymph organs
    - Thymus
    - Bone marrow
  - Secondary lymph organs
    - Lymph nodes
      - Cervical
      - Submandibular
      - Axillary
      - Inguinal
    - Spleen
    - Appendix
    - Tonsils
- Functions
  - Lipid transport
  - Interstitial fluid drainage
  - Immunity
- Circulation
  - Lymph capillaries
  - Lymph vessels
  - Lymphatic ducts

Standard 8

Define the following terms as they apply to immunity.

- Antigen
  - Epitope
- Antibody

Standard 9

Describe innate immunity and give examples of common mechanisms.

- Barriers
  - Physical
  - Chemical
- Fever and Inflammation
- Compliment system
- Phagocytosis

Standard 10

Describe adaptive immunity and give examples of common mechanisms. Describe the roles of T-cells and

B-cells in the immune response.

- Cell-mediated
  - T- cytotoxic
  - T- helper
  - Memory cells
- Antibody mediated (humoral)
  - B-cells
  - Plasma cells
  - T-helper
  - Memory cells

Standard 11

Distinguish between active and passive immunity and natural vs. artificial acquisition of immunity.

Standard 12

Describe the basic structure and functions of an antibody. Identify and describe the five classes of antibodies.

- IgG
- IgM
- IgE
- IgD
- IgA

Standard 13

Contrast the primary and secondary immune responses.

STRAND 13

Students will **develop and use a model** to describe the structures and functions of the cardiovascular system.

Standard 1

List the general functions of cardiovascular system.

Standard 2

Describe the general shape and location of the heart.

Standard 3

Describe the major structures of the heart.

- Layers/membranes
  - Endocardium
  - Myocardium
  - Epicardium (visceral pericardium)
  - Parietal Pericardium
  - Pericardial fluid
- Chambers
  - Atria
  - Ventricles
- Great blood vessels
  - Superior vena cava
  - Inferior vena cava
  - Pulmonary trunk

    - Pulmonary arteries
    - Pulmonary veins
    - Aorta
- Valves
    - Right atrioventricular (AV), tricuspid
    - Pulmonary semilunar
    - Left atrioventricular (AV), bicuspid (mitral)
    - Aortic semilunar

Standard 4

Describe the pattern of blood flow in relation to the great vessels, valves, and chambers of the heart. State when each valve is open or closed during blood flow.

Standard 5

Identify and describe the conduction system of the heart and trace the pathway.

- Sinoatrial (SA) node
- Atrioventricular (AV) node
- AV bundle (Bundle of His)
- Bundle branches
- Purkinje fibers

Standard 6

Given a diagram of an electrocardiogram, state the name of each waveform. Explain what is happening at each stage of the electrocardiogram.

Standard 7

Compare and contrast the action potential of an autorhythmic cell and a myocardial cell.

Standard 8

Describe the parasympathetic and sympathetic innervation of the heart.

Standard 9

Sequence the principal events of the cardiac cycle in terms of systole and diastole.

Standard 10

Define the following cardiac function measurements:

- Heart rate
- Stroke volume
- End-diastolic volume
- End-systolic volume
- Ejection Fraction
- Cardiac output

Standard 11

Describe the histology of arteries and veins. Compare and contrast the microscopic structure of arteries and veins.

- Tunica Externa
- Tunica Media
- Tunica Interna

Standard 12

Describe the histology and anatomy of capillaries. Name three types of capillaries, location, and distinguishing characteristics.

- Continuous – commonly found throughout the body
- Fenestrated - kidneys
- Sinusoid – spleen, liver, bone marrow

Standard 13

Explain the process of capillary exchange of nutrients, gases, and wastes. Describe Starling's Law of the Capillary.

Standard 14

Identify the major arteries of the human body. Define: anastomosis.

- Carotids
- Subclavian
- Brachiocephalic
- Brachial
- Radial
- Aorta
  - Ascending
  - Arch
  - Descending
  - Thoracic
  - Abdominal
- Renal
- Iliac (common, internal, external)
- Femoral
- Popliteal

Standard 15

Identify the major veins of the human body.

- Jugular
- Subclavian
- Brachiocephalic
- Brachial
- Radial
- Vena Cava (superior, inferior)
- Renal
- Iliac (common, internal, external)
- Femoral
- Popliteal

Standard 16

Name the parts of the coronary circulation.

- Coronary arteries
  - Right coronary artery
  - Marginal artery
  - Posterior interventricular
  - Left coronary artery

    - Anterior interventricular (LAD)
    - Circumflex
- Coronary veins
    - Great cardiac vein
    - Anterior cardiac vein
    - Middle cardiac vein
    - Small cardiac vein
- Coronary sinus

Standard 17
Contrast pulmonary and systemic circulation.

Standard 18
Compare and contrast fetal circulation to adult blood flow.

STRAND 14
Students will **construct an explanation** describing the structures and functions associated with the respiratory system.

Standard 1
List the functions of the respiratory system.

Standard 2
List each of the structures through which air passes during inspiration. Differentiate them into upper and lower respiratory tracts and conducting and respiratory zones.

- Structures
    - Nose/mouth
    - Pharynx
        - Nasopharynx
        - Oropharynx
        - Laryngopharynx
    - Larynx
    - Trachea
    - Primary Bronchi
    - Secondary Bronchi
    - Tertiary Bronchi
    - Bronchioles
    - Terminal bronchioles
    - Respiratory bronchioles
    - Alveolar duct
    - Alveolar sacs
    - Alveoli
- Upper Respiratory tracts – structures superior to the larynx
- Lower Respiratory tracts – structures inferior to the larynx
- Conducting zone – nose to terminal bronchioles
- Respiratory zone – respiratory bronchioles to alveoli

Standard 3
Identify the following structures associated with the larynx.

- Epiglottis
- Glottis
- Hyoid bone
- Vocal cords

Standard 4
Identify the trachea and its anatomic features.
- Carina
- Cartilage rings

Standard 5
Identify the gross anatomical features and the coverings of the lungs.
- Apex
- Base
- Lobes
- Fissures
- Cardiac notch
- Hilum
- Visceral pleura
- Parietal pleura
- Pleural cavity
- Pleural fluid

Standard 6
Describe the muscles of respiration and their innervation.
- Diaphragm – phrenic nerve
- External and Internal Intercostals

Standard 7
Describe the histology of the respiratory system.
- Pseudostratified columnar ciliated epithelium
  - Goblet cells
- C-shaped hyaline cartilage of the trachea
- Smooth muscle of the bronchi and bronchioles
- Type 1 alveolar cells
- Type 2 alveolar cells
- Alveolar macrophages
- Alveolar-capillary membrane
  - Simple squamous endothelium

Standard 8
Define pulmonary ventilation, inspiration, and expiration.

Standard 9
Define and apply Boyle's Law and its impact of volume and pressure related to inspiration and expiration.

Standard 10
State the four respiratory volumes and four respiratory capacities. Identify each of these on a spirogram.
- Tidal volume (TV)

- Inspiratory reserve volume (IRV)
- Expiratory reserve volume (ERV)
- Residual volume (RV)
- Vital capacity (VC)
- Inspiratory capacity (IC)
- Functional residual capacity (FRC)
- Total lung capacity (TLC)

Standard 11
State Henry's Law and Dalton's Law. Explain how partial gas pressures are relevant to external and internal respiration.

Standard 12
State the ways oxygen and carbon dioxide are carried in the blood.

Standard 13
State the chemical equation which describes the relationship between carbon dioxide, bicarbonate ion, and carbonic acid in blood. Predict how raising and lowering pH or carbon dioxide concentration will affect respiration rate.

Standard 14
State the location and function of the respiratory control centers.

- Medulla rhythmicity area
  - Inspiratory center
  - Expiratory center
- Pons
  - Pneumotaxic
  - Apneustic

Standard 15
Summarize the embryonic development of the respiratory system. Explain the role of surfactant.

STRAND 15
Students will **ask questions to construct an explanation** to describe the structures and functions associated with the digestive system.

Standard 1
Describe the functions of the digestive system.

Standard 2
Identify the major and accessory structures of the digestive system.

- Alimentary canal structures
  - Mouth
  - Pharynx
  - Esophagus
  - Stomach
  - Small intestines
  - Large intestines
  - Rectum

    - Anus
- Accessory structures
    - Salivary glands (parotid)
    - Teeth
    - Pancreas
    - Gallbladder
    - Liver

Standard 3

Describe and recognize the histology of the alimentary canal (gastrointestinal system). Identify and describe the function of the following layers: mucosa, submucosa, muscularis, serosa.

Standard 4

Describe the anatomy and functions of oral cavity structures.

- Tongue
- Taste buds
- Teeth
    - Deciduous
    - Permanent
    - Parts of a typical tooth.
        - Crown
        - Neck
        - Root
        - Gingiva
        - Periodontal ligament
        - Enamel
        - Dentin
        - Pulp
        - Root canal
    - Salivary Glands
        - Parotid
        - Submandibular
        - Sublingual
    - Enzymes
        - Salivary amylase

Standard 5

Describe the anatomy and functions of the pharynx.

- Nasopharynx
- Oropharynx
- Laryngopharynx

Standard 6

Describe the anatomy and functions of the esophagus.

- Sphincters
    - Upper
    - Lower
- Smooth vs voluntary muscle
- Swallowing (deglutition) stages

- Voluntary
- Pharyngeal
- Esophageal

Standard 7

Describe anatomy, histology and function of the stomach. Explain the function, production, and regulation of hydrochloric acid (HCl) secretion.

- Anatomy
  - Fundus
  - Cardia
  - Body
  - Pyloric antrum
  - Pyloris
  - Pyloric canal
  - Rugae
  - Cardiac sphincter
  - Pyloric sphincter
- Histology
  - Gastric pits
    - Parietal cells – secretes hydrochloric acid (HCl), and intrinsic factor
    - Chief cells – secretes pepsinogen and lipase
    - Mucous neck cells – secretes mucous
    - G cells – secretes gastrin

Standard 8

Describe anatomy, histology and function of the small intestine.

- Anatomy:
  - Duodenum
  - Jejunum
  - Ileum
- Histology:
  - Plicae circularis
  - Villi
  - Microvilli
  - Cells
    - Enterocytes – absorb nutrients
      - Carbohydrates
      - Proteins
      - Lipids
        - lacteals
    - Goblet cells – secretes mucous
    - Paneth cells – enzymes, phagocytes
    - Enteroendocrine – secretes hormones

Standard 9

Describe anatomy, histology and function of the large intestine.

- Anatomy
  - Ileocecal valve
  - Cecum

    - Appendix
    - Ascending colon
    - Transverse colon
    - Descending colon
    - Sigmoid colon
    - Rectum
    - Anus
        - External sphincter
        - Internal sphincter
        - Defecation reflex
- Histology
    - Taeniae coli
    - Haustra
    - Intestinal glands
        - Absorptive cells – absorb water
        - Goblet cells – secrete mucous

Standard 10

Describe anatomy, histology and function of the liver and gall bladder.

- Anatomy
    - Gall bladder
    - Liver
        - Right and left lobes
        - Caudate and quadrate lobes
        - Ligaments
            - Falciform
            - Coronary
            - Round
        - Lobules
        - Hepatic triad
            - Branch of hepatic artery
            - Branch of hepatic portal vein
            - Bile duct
        - Acini
- Histology
    - Sinusoids
    - Bile canaliculi
    - Cells
        - Hepatocytes – inactivates toxins, produces bile, metabolizes carbohydrates, lipids, and proteins, protein production
        - Kupffer cells – macrophage

Standard 11

Diagram the pathway of bile flow from the liver to the duodenum.

- Right and left hepatic ducts
- Common hepatic duct
- Cystic duct (to the gall bladder)
- Common bile duct
- Duodenum

Standard 12
Describe anatomy, histology and function of the pancreas.
- Anatomy
  - Head
  - Tail
  - Body
  - Pancreatic duct
- Histology
  - Islet cells – endocrine function
  - Acini cells – exocrine secretions
    - Amylase
    - Lipase
    - Sodium bicarbonate
    - Protein and nucleic acid enzymes

Standard 13
Compare and contrast mechanical and chemical digestion.

Standard 14
Define the following motility functions:
- Peristalsis
- Segmentation
- Migrating myoelectric complex
- Mass movement

STRAND 16
Students will **obtain, evaluate and communicate information** about the structures and functions associated with the urinary system.

Standard 1
Describe the general functions of the urinary system.

Standard 2
Identify the major structures and locations of the components of the urinary system.
- Kidneys
  - Retroperitoneal
  - Area of inferior thoracic vertebrae (T11-T12) and superior lumbar vertebrae (L1-L2)
  - R. kidney slightly lower than left due to space taken up by liver
- Ureters
  - Tubes that connect the kidneys to the bladder
  - Retroperitoneal
- Bladder
  - Hollow, distensible organ in pelvic cavity
- Urethra

Standard 3
Describe the external and internal anatomy of the kidney.
- External kidney
  - Renal capsule

    - Adipose capsule
    - Renal fascia
- Internal kidney
    - Renal cortex
    - Renal medulla
    - Renal pyramids
    - Renal columns
    - Renal pelvis
    - Nephron
    - Renal papillae
    - Calyces
        - Minor
        - Major

Standard 4

Trace the path of blood flow through the kidneys. Explain what makes the vascular system of the kidneys unique compared to other organs.

- Abdominal aorta
- Renal artery
- Segmental arteries
- Interlobar arteries
- Arcuate arteries
- Cortical radiate arteries
- Afferent arterioles
- Glomerular capillaries
- Efferent arterioles *only arteriole in the body that leaves a capillary
- Peritubular capillaries (including vasa recta in juxtamedullary nephrons)
- Cortical radiate veins
- Arcuate veins
- Interlobar veins
- Renal vein
- Inferior vena cava

Standard 5

Identify the structures that comprise the nephron. Differentiate between cortical and juxtamedullary nephrons. Identify 3 basic functions performed by the nephrons (glomerulus and renal tubules).

- Kidney nephrons
    - Cortical nephron – most common
    - Juxtamedullary nephron – concentrates urine
- Nephron structures
    - Renal corpuscle
        - Glomerulus
        - Glomerular (Bowman’s) capsule
    - Renal tubules
        - Proximal convoluted tubule
        - Descending limb
        - Nephron loop
        - Ascending limb
        - Distal convoluted tubule

        - Collecting duct
- Functions
    - Glomerular filtration
    - Tubular reabsorption
    - Tubular secretion

Standard 6

Describe the structures and pressures which contribute to the filtering of blood through the glomerular membrane.

- Structures
    - Three layers of glomerular membrane:
        - Fenestrated capillaries
        - Basal lamina
        - Podocytes
            - Pedicels
            - Filtration slits
- Pressures
    - Net filtration pressure
        - Glomerular blood hydrostatic pressure
        - Blood colloid osmotic pressure
        - Capsular hydrostatic pressure

Standard 7

Identify and describe the three regulatory mechanisms to control the glomerular filtration rate (GFR).

- Renal autoregulation
    - Tubuloglomerular feedback
    - Juxtaglomerular apparatus
- Neural regulation
- Hormonal regulation
    - Angiotensin II
    - Atrial natriuretic peptide (ANP)

Standard 8

Compare and contrast tubular reabsorption and secretion.

- Reabsorption
    - Tubules to blood
    - Majority of solutes and water reabsorbed in the proximal convoluted tubule.
    - Reabsorptive cells: cuboidal epithelium with microvilli
    - Transport maximum
    - Water reabsorption
        - Obligatory reabsorption
        - Facultative absorption
- Tubular secretion
    - Blood to tubules
        - Secreted substances include H+, K+, NH4+, creatinine, some drugs

Standard 9

Explain the countercurrent multiplier. Describe how the countercurrent multiplier helps regulate blood osmolarity. Describe the countercurrent exchange mechanism and how it assists with water reabsorption.

Standard 10

Describe the anatomy of the ureters. Identify structures and mechanisms that assist with the flow of urine through the ureters. Compare and contrast male and female urethras.

- Anatomy
  - Retroperitoneal
  - 10-12 inches long
  - Attach to posterior base of the bladder
- Urine flow
  - Smooth muscle in ureters assist with peristaltic contractions
  - Gravity
  - Hydrostatic pressure
- Male and female urethras
  - Male
    - 3 regions: prostatic, membranous, spongy
    - Also has reproductive functions
    - 20 cm in length
  - Female
    - External opening between the clitoris and vaginal opening
    - 4 cm
    - Closer proximity to anus

Standard 11

Describe the anatomy of the bladder. Explain the micturition reflex.

- Anatomy
  - Hollow, distensible organ
  - Posterior to pubic symphysis in pelvic cavity
  - Female bladder is slightly smaller than males (uterus takes up space)
  - Rugae (folds)
  - Transitional epithelium
  - Detrusor muscle
  - Trigone (comprised of 2 ureters and urethra at the base of the bladder)
  - Internal and external sphincters
- Micturition

Standard 12

Describe physical and chemical characteristics of urine.

Standard 13

Compare the water and electrolyte concentrations in intra- and extracellular compartments.

- Water distribution in the body
  - 2/3 intracellular
  - 1/3 extracellular
- Ion concentration
  - Extracellular ions
    - Sodium
    - Chloride
    - Bicarbonate
    - Calcium
  - Intracellular ions

- Protien anions
- Potassium
- Magnesium
- Phosphate
- Sulfate

Standard 14
Characterize the role of buffers, ventilation, and renal function in maintaining acid-base homeostasis.

STRAND 17
Students will **develop and use models** to describe the structures and functions associated with the reproductive system.

Standard 1
List the functions of the reproductive system.

Standard 2
Identify male & female reproductive system anatomy.

- Male:
  - Testes
  - Spermatic cord
  - Ductus deferens (vas deferens)
  - Scrotum
  - Dartos muscle
  - Cremaster muscle
  - Epididymis
  - Urethra
  - Prostate gland
  - Seminal vesicles
  - Bulbourethral (Cowper's) gland
  - Penis
  - Corpus spongiosum
  - Corpora cavernosa
  - Glans penis
  - Prepuce (foreskin)
  - Seminiferous tubules
  - Rete testis
- Female:
  - Ovaries
  - Uterine (Fallopian) tubes
    - Infundibulum and fimbriae
    - Ampulla
    - Isthmus
  - Uterus
    - Endometrium
      - Simple columnar epithelium
      - Stratum functionalis
      - Stratum basalis

        - Straight arterioles
        - Spiral arterioles
    - Myometrium
    - Perimetrium
- Clitoris
- Cervix
- Vagina
- Labia minora
- Labia majora
- Perineum
- Mons pubis
- Mammary glands
    - Alveolar glands
    - Myopeithelial cells
    - Areola
    - Suspensory ligaments (Cooper's ligaments)

Standard 3

Characterize the process of spermatogenesis and the pathway from sperm production to release through ejaculation. Describe the role of accessory glands in the production of reproductive fluids (semen, pre-ejaculate).

- Spermatogensis:
    - Spermatogonia -> primary spermatocyte -> secondary spermatocyte -> spermatids -> spermatozoon
- Pathway:
    - Seminiferous tubules -> rete testis -> efferent ducts -> epididymis -> ductus deferens -> ejaculatory duct -> urethra ->ejaculation
- Glands:
    - Bulbourethral (Cowper's) glands: secrete alkaline lubricant for urethra and buffer pH (pre-ejaculate)
    - Seminal vesicles: contribute to semen
    - Prostate gland: contribute to semen

Standard 4

Identify and describe the stages of the ovarian cycle including oogenesis and follicular development. Describe female gamete transport and the organs involved.

- Follicular development
    - Primordial follicles -> primary follicle -> secondary follicle -> mature follicle -> corpus hemorrhagicum -> corpus luteum -> corpus albicans
- Gamete transport
    - Ovary -> fimbriae -> uterine tube ->uterus
- Oocyte development:
    - Primary oocyte
    - Secondary oocyte
    - Ovum

Standard 5

Identify and describe the phases of the uterine cycle including histology and blood supply.

- Endometrium
    - Simple columnar epithelium (shed during menstruation)
    - Stratum functionalis (shed during menstruation)

    - Stratum basalis
- Blood supply
    - Straight arterioles
    - Spiral arterioes
- Uterine phases and key days:
    - Menstural phase - stratum functionalis and spiral arterioles are shed
    - Proliferative phase - spiral arterioles are rebuilt and proliferating straum functionalis
    - Secretory phase
    - Day 1 - first day of menstrual flow
    - Day 14 -ovulation

Standard 6

Relate the impact of hormone secretions to the timeline of the uterine and ovarian cycles.

- Hormones to include:
    - Estrogen- influences the proliferative phase
    - Progesterone – influences secretory phase
    - Luteinizing hormone (LH) – influences ovulation
    - Follicle stimulating hormone (FSH) – influences gamete maturation

Standard 7

Compare and contrast the process of meiosis and gametogenesis for male and female gametes. Define crossing-over.

Standard 8

Explain the process of conception, including coitus, sperm capacitation, slow block to polyspermy, and fertilization. Describe embryonic events from fertilization to gastrulation and the development of extra-embryonic membranes. Describe fetal events from gastrulation to organogenesis.

- Key items:
    - Zygote (day 0)
    - Blastocyst (~ day 5)
    - Implantation (~ day 7)
    - Gastrulation (~ day 16)
    - Fetal period versus embryonic period
    - Placental development

Standard 9

Describe the role of the following hormones in reproduction:

- Human Chorionic Gonadotropin (hCG) – released by chorionic membrane and acts on the gonads (corpus luteum). Maintains corpus luteum activity following implantation if pregnancy occurs.
- Relaxin – released by placenta and relaxes pubic symphysis and cervix to aid dilation for delivery.
- Human Chorionic Somatomammotropin (hCS) – alters maternal metabolism for increased nutritional requirements of the fetus.
- Corticotropic Releasing Hormone (CRH) – role of birth and increased cortisol secretion from adrenal cortex

Standard 10

Describe the stages of labor and the hormones involved. Describe labor and suckling as an example of a positive feedback loop and include the hormones involved.

- Labor stages:

- 1. Dilation stage – uterine contractions and oxytocin release leading to dilation of the cervix
- 2. Expulsion stage – end of dilation stage to delivery
- 3. Placental stage – after delivery to expelling of the placenta

- Suckling:
  - Oxytocin – milk release
  - Prolactin – milk production

Standard 11

Describe the role of the endocrine system and other factors in male and female puberty. Identify male and female primary and secondary sexual characteristics.

Performance Skills

1. Create a detailed Personal Healthcare Career Plan.
   - What is your healthcare career goal?
   - Reflect on what you have done so far to prepare for that career. Include coursework, HOSA,
   - internships, employment, volunteerism, etc.
   - Define the steps/requirements or additional training that you will need to complete following high
   - school.
   - Determine the durable skills that your career will need.
   - How do you plan to finance any additional school or training needed?
2. Demonstrate a clinical assessment for each of the twelve cranial nerves. Differentiate whether it is testing sensory pathways, motor pathways, or both.
3. Create a research-based poster. Determine a health-related topic and pose a research question. Using scientific methods conduct your research. When complete, create a poster to include a title, abstract, methods, results, conclusions, references, and images. (Use HOSA Research Poster competitive guidelines for reference.)

Durable Skills

- Professionalism
- Collaboration
- Communication
- Leadership
- Innovation
- Adaptability

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand									Total Points	Total Questions
Med Anatomy & Phys, Adv	703	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	100	100
		3	4	2	2	2	3	8	3	17		
		10	**11**	**12**	**13**	**14**	**15**	**16**	**17**			
		5	7	12	10	8	5	7	2			

KEY VOCABULARY CLARIFICATIONS

adenohypophysis: The anterior part of the pituitary gland.

anastomosis: A connection between two blood vessels that are usually separate.

apneustic: Refers to a center in the pons that helps control breathing.

autorhythmic: Cells that can generate their own electrical impulses, like certain heart cells.

Boyle's Law: A law in physics that describes how the pressure and volume of a gas are inversely related (as volume increases, pressure decreases, and vice versa). This is important for understanding how air moves in and out of the lungs.

buffer: A substance that helps to maintain a stable pH by resisting changes in acidity or alkalinity.

dermatome: Specific area of skin that is mainly supplied by a single spinal nerve.

erythropoiesis: The process of producing red blood cells.

fibrinolysis: The process of breaking down blood clots.

filtration: The process of separating substances in a solution by passing them through a filter.

gastrulation: An early stage of embryonic development where the three primary germ layers are formed.

Glomerular (Bowman's) capsule: A cup-shaped structure surrounding the glomerulus in the kidney where filtration occurs.

gustatory: Relating to the sense of taste.

hematopoiesis: The process of forming all types of blood cells.

Henry's Law: A law that states that the amount of gas dissolved in a liquid is proportional to its partial pressure above the liquid. This is relevant for gas exchange in the lungs and tissues.

homunculus: A distorted representation of the human body, reflecting the relative amount of cortical brain area devoted to sensory perception or motor control of different body parts.

hypophyseal: Relating to the pituitary gland.

hypothalamus: A region of the brain that controls many bodily functions, including hormone release from the pituitary gland.

juxtamedullary: A type of nephron in the kidney with a long loop of Henle that helps concentrate urine.

Langerhans cells: Immune cells found in the epidermis.

Merkel cells: Sensory cells in the epidermis that detect touch.

myopeithelial cells: Cells that surround glands and help in the expulsion of secretions, such as milk from mammary glands.

neurohypophysis: The posterior part of the pituitary gland.

spirogram: A graph that records lung volumes and capacities during breathing.

Starling's Law of the Capillary: Describes the movement of fluid across capillary walls based on hydrostatic and osmotic pressures.

tracts: Bundles of nerve fibers in the central nervous system.

transduction: The process by which sensory receptors convert a stimulus into an electrical signal.

visceral: Pertaining to the organs within a body cavity.

STRANDS AND STANDARDS
MEDICAL MATH

Course Description

An instructional program that prepares students with critical thinking skills to compute mathematical equations related to healthcare. The course connects math concepts to medical-physiological applications. Students will engage in math simulations including but not limited to problem solving, reasoning and proof, communication, connections, and representations.

Intended Grade Level	11-12
Units of Credit	0.5
Core Code	36.01.00.00.150
Concurrent Enrollment Core Code	None
Prerequisite	None
Skill Certification Test Number	NA
Skill Certification Cut Score	**NA**
Test Weight	NA
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Medical Math
Endorsement 2	
Endorsement 3	

STRAND 1

Students will investigate how mathematics is applied in healthcare.

Standard 1

Analyze the use of medical mathematics in the healthcare system.

- Explore various healthcare careers and the mathematical skills used in each one.
- Compare and contrast at least two different careers.

STRAND 2

Students will use math skills to solve problems related to healthcare.

Standard 1

Demonstrate fluency in computations and make reasonable estimates.

- Evaluate and simplify numerical expressions containing rational numbers using the order of operations.
- Compute solutions to problems and determine the reasonableness of an answer by relating them to applied scenarios.
- Whole numbers
  - Cholesterol
  - Intake and output
  - Laboratory Values
  - Lever systems
  - Nutrition
  - Quantities
  - Supplies and inventories
  - Vital signs labs

Standard 2

Use rational numbers in their most effective forms to solve problems.

- Choose appropriate and convenient forms of rational numbers for solving problems and representing answers.
- Compute solutions to problems and determine the reasonableness of an answer by relating them to applied scenarios.
- Decimals:
  - Decimals
  - EKG's
  - Laboratory values
  - Medications
  - Nutrition
  - Rounding
  - Temperature
  - Tools, instruments
  - Weights

Standard 3

Identify and analyze the relationships among rational numbers and the effects of mathematical operations on them.

- Compute solutions to problems and determine the reasonableness of an answer by relating them to

applied scenarios.
- Fractions
  - Conversions (Fahrenheit/Celsius)
  - EKG's
  - Estimation
  - Laboratory values
  - Medications
  - Nutrition
  - Tools, instruments
  - Weights

Standard 4

Calculate and compare percentages.

- Compute solutions to problems and determine the reasonableness of an answer by relating them to applied scenarios.
  - Blood loss
  - Body composition
  - Body surface area, burns
  - Cardiac output
  - Chemical solutions
  - Growth charts
  - Intake/output
  - Laboratory values
  - Medications
  - Nutrition
  - Oxygen saturation
  - Stroke volume
  - Target heart rate

STRAND 3

Students will calculate and analyze proportions and ratios.

Standard 1

Use algebraic properties to evaluate, solve and analyze mathematical problems.

- Solve proportions that include algebraic first-degree expressions (solve for X or use dimensional analysis).
  - Nutrition
  - Chemical solutions
  - Dosage conversions
  - Convert units of measure

Standard 2

Apply ratios to analyze data and identify patterns or relationships.

- Diseases (statistics)analysis
- Laboratory values
- Medications

STRAND 4

Students will gather and analyze data using medical instruments.

Standard 1

Analyze patterns, relationships, and functions to represent mathematical situations using collected data.

- Compute solutions to problems and determine the reasonableness of an answer by relating them to applied scenarios.
  - Body composition
  - Body temperature
  - Pharmacology
  - Pre/Post workout weight analysis
  - Vital signs

Standard 2

Represent quantitative relationships using mathematical models and symbols.

- Find and interpret rates of change by analyzing graphical and numerical data.
- Understand measurable attributes of objects and the units, systems, and processes of measurement.
- Solve problems using visualization and spatial reasoning.
- Instruments
  - Centrifuges
  - Goniometry – Range of Motion (ROM)
  - Intravenous (IV) flow rates
  - Macro/micro drops (tubing)
  - Oxygen flowmeter: oxygen flow rates
  - Pulse oximeters
  - Rulers, tape measures
  - Scales
  - Sphygmomanometer gauges (blood pressure)
  - Syringes
  - Thermometers

STRAND 5

Students will formulate and answer questions by collecting, organizing, and analyzing statistical data.

Standard 1

Graph, analyze, and interpret one-variable quantitative data.

- Find the mean, median, mode, range, and five number summary for a statistical data set.
- Graphs and charts.
  - Body composition
  - Body mass index (BMI)
  - Cardiac output
  - Census
  - Clinical trials
  - Disease, mortality rates
  - Effectiveness (facilities, providers)
  - Healthcare costs
  - Height, weight, measurement graphs
  - Intake and output charts

- Medication errors
- Pulse oximeters
- Sphygmomanometer (blood pressure)
- Temperature, pulse, respiration graphs
- Thermometers
- Treatment prognosis

Standard 2

Graph, analyze, and interpret two-variables quantitative data.

- Record, organize and display a set statistical data. Examples include:
  - Scatter plot
  - Residual plot
- Determine whether the pattern of the data is linear or nonlinear when given in a list, table, or graph.
- Interpret the correlation between two variables as positive, negative, or having no correlation.
- Find a line of best fit by estimation, choosing two points, or using technology for a given set of statistical data. Analyze the meaning of the slope and y-intercept of a line of best fit as it relates to the statistical data set.
- Make predictions and estimations and determine their reasonableness using a regression equation (line of best fit).
- Analyze the meaning of the maximum or minimum and intercepts of the regression equation as they relate to a given set of bivariate data.
- Graphs and charts
  - Body composition
  - Body mass index (BMI)
  - Cardiac output
  - Census (hospital admissions)
  - Clinical trials
  - Disease, mortality rates
  - Effectiveness (facilities, providers)
  - Healthcare costs
  - Height, weight, measurement graphs
  - Intake and output charts
  - Job outlook, projections
  - Temperature, pulse, respiration graphs

Standard 3

Graph, analyze and interpret categorical data.

- Record, organize and display a set statistical data. Examples include:
  - Two-way table
  - Pie chart
  - Bar graph
- Calculate and communicate the probability of an event as a fraction, percent, ratio, or decimal.
- Determine the conditional probability of an event occurring (false positive/false negative).
- Graphs and charts
  - Acuities
  - Census
  - Clinical trials
  - Disease, mortality rates
  - Effectiveness (facilities, providers)

- Epidemiology
- Healthcare costs
- Medication errors
- Reliability and validity
- Treatment prognosis
- Wellness indicators

STRAND 6

Students will apply mathematical concepts to accurately calculate medication dosages.

Standard 1

Compute fluently and make reasonable estimates.

- Reading medication labels
- Interpreting prescriptions

Standard 2

Evaluate, solve, and analyze mathematical situations using algebraic properties and symbols.

- Simplify and evaluate numerical expressions (including integer exponents and square roots), algebraic expressions, formulas, and equations.
- Using medical reference materials to determine if calculated dosages are safe to administer.

Standard 3

Represent quantitative relationships using mathematical models and symbols.

- Dosing
- Dosage conversions
- Roman numerals

STRAND 7

Students will demonstrate the use of mathematics in medical accounting and healthcare business operations.

Standard 1

Apply systems of order.

- Numerical filing
- Appointment scheduling
  - Time (12/24 hour clock)

Standard 2

Evaluate, solve, and analyze mathematical situations using algebraic properties.

- Maintaining accounts
- Checks, deposit slips, and receipts
- Calculating cash transactions/Payroll
- Budgeting
- Depreciation, amortization
- Insurance

STRAND 8

Students will demonstrate the use of exponents and logarithms related to healthcare.

Standard 1

Utilize properties of exponentials to solve equations.

- Radiation half-life and exposure
  - Medications half life
    - Within the body
    - Shelf life of medication

Standard 2

Use properties of logarithms to solve equations.

- pH

Performance Skills

- Oral presentation on the mathematics used in chosen healthcare career exploration. .
- Select a healthcare career to create a business model including a graph using data collected.

Durable Skills

- Professionalism
- Collaboration
- Communication (Oral/Written)
- Leadership
- Innovation
- Adaptability

Skill Certification Test Points by Strand

No exam currently, but plan to develop one to align with this revision.

KEY VOCABULARY CLARIFICATIONS

Amortization: A process of paying off debt with a regular stream of principal and interest payments.

Acuities: Refers to the sharpness or keenness of thought, vision, or hearing, often used in a medical context to describe the severity of a patient's condition.

Bivariate data: Data that involves two different variables.

Body surface area (BSA): A measurement used in medicine, especially for calculating medication dosages and burn areas, based on height and weight.

Cardiac output: The volume of blood pumped by the heart per minute.

Dimensional analysis: A problem-solving method that uses the fact that any number or expression can be multiplied by one without changing its value, often used for converting units.

Epidemiology: The branch of medicine that deals with the incidence, distribution, and possible control of diseases and other factors relating to health.

Five-number summary: A set of descriptive statistics that provides information about a dataset: minimum, first quartile (Q1), median, third quartile (Q3), and maximum.

Goniometry: The measurement of angles, especially those of the joints in the body, used to assess range of motion (ROM).

Intake and output: Measurements of all fluids a patient ingests and excretes, used to monitor fluid balance.

Line of best fit: A line drawn through a scatter plot that best represents the relationship between two variables.

Macro/micro drops (tubing): Refers to the size of drops delivered by IV tubing, used to calculate IV flow rates.

Mode: The number that appears most frequently in a set of numbers.

Order of operations: A set of rules that dictate the sequence in which mathematical operations should be performed (e.g., PEMDAS/BODMAS).

Oxygen saturation: The percentage of hemoglobin binding sites in the bloodstream occupied by oxygen.

Pulse oximeters: Medical devices that indirectly monitor the oxygen saturation of a patient's blood.

Radiation half-life: The time it takes for half of the radioactive atoms in a sample to decay.

Regression equation: An equation that describes the relationship between a dependent variable and one or more independent variables, often used to make predictions.

Residual plot: A graph that shows the residuals (the differences between observed and predicted values) on the vertical axis and the independent variable on the horizontal axis.

Scatter plot: A graph that displays values for two variables for a set of data.

Sphygmomanometer gauges: Instruments used to measure blood pressure.

Stroke volume: The volume of blood pumped from the left ventricle per beat.

Target heart rate: The minimum number of heartbeats in a given period of time in order to reach the level of exertion necessary for cardiovascular fitness.

Two-way table: A table that displays the frequencies of two categorical variables.

Y-intercept: The point where a line crosses the y-axis on a graph.

Sources

STRANDS AND STANDARDS
MEDICAL TERMINOLOGY

Course Description

A one-semester course that helps students understand the Greek- and Latin-based language of medicine and healthcare. Emphasis is placed upon word building, word roots, suffixes, prefixes, abbreviations, symbols, anatomical terms, and terms associated with movements of the human body. This course also stresses the proper pronunciation, spelling, and usage of medical terminology. This class is helpful to anyone considering a career in healthcare.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	36.01.00.00.175
Concurrent Enrollment Core Code	36.01.00.13.175
Prerequisite	None
Skill Certification Test Number	704
Skill Certification Cut Score	**74%**
Test Weight	1.0
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s) (one of the following)	
Endorsement 1	Medical Anatomy & Physiology
Endorsement 2	EMT
Endorsement 3	Surgical Technician
Endorsement 4	Medical Assistant
Endorsement 5	Nurse Assistant
Endorsement 6	Pharmacy Technician

Updated: August 2025

STRAND 1

Students will know and apply the rules for building medical terms. These concepts WILL BE USED THROUGHOUT ALL OTHER STRANDS.

Standard 1

Understand the basic structure of medical terms.

- Root: generally, a noun (could include both a Greek and Latin version)
- Combining form: a vowel added to a root connecting to another root or the suffix when it begins with a consonant.
- Prefix: modifying what is happening to the root added to the beginning of the term.
- Suffix: modifying what is happening to the root added to the end of the term.

Standard 2

Define general medical prefixes.

- a-: without, absence of
- ab-: away from
- ad-: toward, to
- af-: toward
- ambi-: both
- an-: without, absence of
- ana-: up, back, apart
- ante-: before
- anti-: against
- bi-: two, double, both
- bin-: two, double
- cata-: downward or down
- circum-: around
- co-: with, together
- com-: with, together
- con-: with, together
- contra-: against, opposite
- de-: down, from
- deca-: ten
- demi-: half
- di-: twice; double, two
- dia-: through, apart, across
- dif-: to carry apart
- dis-: apart, free from
- dys-: painful, bad, difficult
- ecto-: out, outside, outer layer
- ef-: away from
- en-: in, inside
- epi-: on, upon
- eu-: true, good, normal
- ex-: outside
- extra-: outside
- fore-: in front of
- im-: not
- in-: in, within, not
- inflam-: to flame within
- infra-: beneath, below
- inter-: between
- intra-: within, inside
- iso-: equal
- juxta-: near
- kilo-: one thousand
- macro-: large
- mal-: bad, abnormal
- medi-: middle
- mega-: large
- meso-: middle
- meta-: beyond, change
- micro-: very small
- mono-: single, one
- multi-: many, much
- neo-: new
- nocti-: night
- non-: no, none
- nona-: nine
- null-: none
- octa-: eight
- pan-: all, total
- para-: beside, beyond, near
- per-: through, by
- peri-: around
- platy-: flat
- post-: after, behind
- pre-: for, before, in front of
- primi-: first
- pro-: before, for
- pseud/-: false
- quad-: four
- quint-: five
- re-: again, back
- retro-: behind, backward

- sacchar-: sugar
- sect-: cut
- semi-: half, part of a whole
- sens-: feeling
- sepsis-: infection
- septic-: pathogenic
- septa-: seven
- sexti-: six
- styl/o-: stake, pole
- super-: above
- supra-: above
- sym-: with, together
- syn-: with, together
- tachy-: swift, fast
- temp-: temperature, heat
- tetan-: stiff
- tetra-: four
- trans-: through, across
- tri-: three
- tuber-: swelling; enlargement
- ultra-: beyond, excess
- uni-: one

Standard 3

Define general medical word roots/combining forms.

- abdomin/o: abdomen
- acr/o: extremity
- alb: white
- ambul: to walk
- antr/o: antrum; nearly closed cavity
- atel/o: imperfect
- aut/o: self
- ax/o: axis
- bar/o: pressure
- bi/o: life
- blast/o: developing cell
- bucc/o: cheek
- cac/o: bad or ill
- cal: pebble, stone or calcium
- caud/o: tail
- chlor/o: green
- chrom/o: color
- coccus(s): round, spherical form of bacteria
- cocci(pl): round, spherical form of bacteria
- colla: glue
- coni/o: dust
- corp/o: body
- cry/o: cold
- crypt/o: hidden
- culd/o: cul-de-sac; a blind pouch
- cyan/o: blue
- cyt/o: cell
- dipl/o: double
- dist/o: away from the point of origin
- electr/o: electricity
- end/o: inside
- erg/o: work
- erythr/o: red
- eti/o: cause of disease
- gen/o: forming, producing, origin
- geront/o: old age, elderly
- gluc/o: sugar, sweet, glucose
- glyc/o: sugar, sweet
- gnos/o: knowledge
- herni/o: hernia or protrusion of an organ through the body wall
- heter/o: other, different
- home/o: same; constant unchanging state
- homo: same
- hydr/o: water
- idi/o- one's own self
- inguin/o: inguinal or groin
- later/o: side
- leuk/o: white
- lith/o: stone, calcification
- lys/o: to kill, separating destruction
- megal/o: large
- ment/o: mind
- morph/o: form, shape
- mot/o: moving
- muc/o: mucus
- myc/o: fungus
- narc/o: numbness, stupor
- nas/o: nose
- natr/o: sodium
- necr/o: death of cells
- olig/o: few, scant
- omphal/o: umbilicus, navel, belly button
- onc/o: mass, tumor
- orb: circle, orbit
- or/o: mouth
- pariet/o: wall
- path/o: disease
- phag/o: to eat
- pharmac/o: drug, medicine

- phas/o: speech
- physi/o: function
- pil/o: hair
- polyp/o: small growth
- por/o: small openings
- proxim/o: near point of origin
- py/o: pus
- pyr/o: fire, fever
- reticul/o: network of cells
- stomat/o: mouth
- therm/o: heat
- ton/o: tension, pressure
- varic/o: twisted, swollen vein
- ventr/o: front
- vesic/o: fluid filled sac bladder
- viscer/o: internal organs

Standard 4

Define general medical suffixes.

- -able: capable
- -ac: pertaining to
- -al: pertaining to
- -algia: pain
- -algesia: pain
- -apheresis: removal
- -ar: pertaining to
- -arche: first; beginning
- -asia: state of condition of
- -asis: state or condition of
- -asthenia: weakness, lack of strength
- -ary: pertaining to
- -atresia: absence of a normal opening; occlusion
- -blast: embryonic; tissue building cell
- -cele: herniation, pouch
- -cide: kill
- -cise: cut
- -clasis: breakdown
- -clysis: washing
- -clast: destructive cell
- -cyte: cell
- -drome: symptoms
- -dynia: pain
- -eal: pertaining to
- -ectomy: removal of, cut out excision of
- -edema: swelling
- -esis: condition
- -ferous: producing
- -gen: to produce, origin
- -genesis: to produce, origin
- -genic: to produce, origin
- -genous: kind, type
- -gram: record picture
- -graph: instrument that records
- -grapher: one who records
- -graphy: the process of recording
- -ia: state of, condition, process
- -ial: pertaining to
- -iasis: pathological or abnormal condition
- -iatric: medical profession; physician
- -ic: pertaining to
- -ical: pertaining to
- -ician: one who
- -ictal: seizure, attack
- -id: form or shape
- -ism: condition or state of
- -ist: one who specializes
- -itis: inflammation of or infection of
- -ity: condition of
- -ium: pertaining to, structure
- -kinetic: motion
- -lemma: membrane
- -logy: study of
- -logist: one who studies
- -lysis: dissolution, breakdown, destruction
- -megaly: enlarged
- -meter: instrument to measure
- -metry: process of measurement
- -mortem: death
- -necrosis: death of cells
- -odynia: pain
- -oid: resembling, like
- -oma: mass, tumor
- -opsy: to view
- -ose: pertaining to; sugar
- -osis: condition of
- -ous: pertaining to
- -pathy: relating to disease
- -pexy: surgical fixation or suspension
- -phage: eating
- -phagia: eating
- -phonia: sound or voice
- -physis: growth
- -plasia: formation, growth
- -plasm: living tissue
- -plasty: surgical repair

- -poiesis: making or production
- -porosis: condition of holes or passages
- -rrhagia: burst forth; hemorrhage
- -rrhaphy: suture, repair
- -rrhea: discharge, flow
- -rrhexis: rupture
- -sarcoma: cancer of connective tissue
- -scope: instrument to view or examine
- -scopy: visualize or view
- -sis: state of; condition
- -stomy: make a new opening
- -stenosis: narrowing or constriction
- -therapy: treatment
- -tic: pertaining to
- -tome: cutting instrument
- -tomy: to cut into; incision
- -trophy: growth or development
- -um: pertaining to
- -y: the act, or result of an action, a condition or quality; process

Standard 5

Interpret and apply general medical abbreviations.

- A: assessment
- ac: before meals
- ad lib: as desired
- am/AM: between midnight and noon
- amt: amount
- bid: twice a day
- Bx: biopsy: to take a section of living tissue for viewing
- C: Celsius
- CC: chief complaint
- cc: cubic centimeter
- cm: centimeter
- c/o: complains of
- CT: computed tomography
- d: day
- dc/DC/D/C: discontinue
- DOB: date of birth
- Dx: diagnosis
- ER: emergency room
- ETA: estimated time of arrival
- F: Fahrenheit
- FUO: fever of undetermined (or unknown) origin
- g/gm: gram
- gtt/gtts: drop or drops
- h: hour
- H & P/HxPx: history and physical
- H_20: water
- H_20_2: hydrogen peroxide
- Hg: mercury
- hs: at bedtime
- Ht: height
- Hx: history
- I & D: incision and drainage
- ICU: intensive care unit
- IP: inpatient
- K: potassium
- Kg: kilogram
- L/l: liter
- lb/#: pound
- mg: milligram
- ml: milliliter
- mm: millimeter
- MRI: magnetic resonance imaging
- N/A: not applicable
- Na: sodium
- neg: negative
- NKA: no known allergies
- NKDA: no known drug allergies
- noct: night
- OD: overdose or right eye
- oint: ointment
- OP: outpatient
- OR: operating room
- OTC: over-the-counter
- OV: office visit
- oz: ounce
- PE (Physical Exam): physical exam
- per wk: per week
- PET: positron emission tomography
- PK: pain killer
- pm/PM: between noon and midnight
- PRN/prn: as needed
- Pt/pt: patient
- q: every
- qd: every day
- qid: four times a day
- R/O, r/o: rule out
- ROS: review of systems
- Rx: prescription
- sig: instructions or directions
- SO: standing order
- SOAP: Subjective, Objective, Assessment, Plan

- S & S: signs and symptoms
- stat: immediately
- T: temperature
- tab(s): tablet(s)
- Tbsp: tablespoon
- temp: temperature
- tid: three times a day
- TPR: temperature, pulse, and respiration
- tsp: teaspoon
- Tx: therapy or treatment
- UNK: unknown
- VS: vital signs
- w/a: when awake
- wk: week
- WNL: within normal limits
- Wt: weight
- YOB: year of birth
- yr: year

Career related abbreviations

- ATC: Athletic Trainer Certified
- CNA: Certified Nursing Assistant
- DO: Doctor of Osteopathic Medicine
- DPM: Doctor of Podiatric Medicine
- EMT: Emergency Medical Technician
- FP: Family Practice
- MD: Doctor of Medicine
- NP: Nurse Practitioner
- OD: Doctor of Optometry
- OT: Occupational Therapist
- PA: Physician Assistant
- PCT: Patient Care Technician
- PT: Physical Therapist
- RN: Registered Nurse
- RT: Respiratory Therapist

Standard 6

Interpret general medical symbols.

- >: greater than
- < : less than
- +: positive
- -: negative
- ~: approximately
- %: percent
- c̄ : with
- s̄ : without
- p̄ : after
- ♂: male
- ♀: female
- ↑: increase
- ↓: decrease
- @: at
- ° :degree
- Δ: change or changed
- Ⓡ : right
- Ⓛ : left
- Ⓑ : Bilateral
- →: causes; transfer to
- ←: is due to

Standard 7

Create medical terms using the following rules:

- A word root needs no combining form if links to a suffix that begins with a vowel.
- A combining form (root + vowel, usually an O) links a suffix that begins with a consonant
- A combining form (root + vowel, usually an O) links a root to another root to form a compound word. This holds true even if the next root begins with a vowel.

Standard 8

Convert medical terms between singular and plural forms.

STRAND 2

Students will define anatomical terms and planes.

Standard 1

Recognize and apply identified anatomical terms.

- acromial: point of the shoulder
- antebrachial: forearm
- antecubital: front of elbow

- axillary: armpit
- brachial: arm
- buccal: cheek
- carpal: wrist
- cephalic: head
- cervical: neck
- coxal: hip
- cranial: skull
- crural: shin/lower leg
- cubital: elbow
- digital: finger
- femoral: thigh
- frontal: forehead
- genital: external reproductive organs
- gluteal: buttocks
- inguinal: groin
- lumbar: lower back
- mental: chin
- nasal: nose
- occipital: posterior of the head
- optic: eye
- orbital: eye cavity
- oral: mouth
- otic: ear
- palmar: palm
- patellar: knee
- pectoral: front of the chest
- pedal: foot
- perineal: between the thighs, the anus, and the external reproductive organs
- plantar: sole of the foot
- popliteal: back of the knee
- sternal: anterior of rib cage
- sural: calf of the leg
- tarsal: ankle
- thoracic: chest
- umbilical: navel
- vertebral: spinal cloumn

Standard 2

Define terms associated with the planes of the body.

- sagittal: divides the body into two parts lengthwise, right and left, although not necessarily into halves
- midsagittal: the sagittal plane dividing the body into equal parts or halves
- frontal (coronal): divides the body into front and back sections from top to bottom
- transverse (horizontal): divides the body into upper and lower portions

Standard 3

Describe anatomical position as a reference point for describing areas of the body.

STRAND 3

Students will define terms associated with movement and direction. (See included list)

Standard 1

Describe and apply identified terms associated with movement.

- abduction: moving a body part away from the midline of the body
- adduction: moving a body part toward the midline of the body
- depression: lowering a part
- elevation: raising a part
- plantar flexion: ankle movement pointing the foot downward
- dorsiflexion: ankle movement bringing the foot toward the shin
- eversion: turning the sole of the foot outward
- inversion: turning the sole of the foot inward
- external rotation: rotation of the hip or shoulder away from the midline
- internal rotation: rotation of the hip or shoulder toward the midline
- extension: straightening of a joint or increasing the angle between two bones
- flexion: bending of a joint or decreasing the angle between two bones
- hyperextension: excessive extension of the parts of a joint beyond anatomical position

- pronation: turning the arm downward (palm down)
- supination: turning the arm upward (palm up)
- protraction: moving a part forward
- retraction: moving a part backward
- circumduction: tri-planar circular motion at the hip or shoulder
- rotation: turning on a single axis

Standard 2

Define directional terms.

- superior: toward the head or upper portion of the body
- inferior: toward the feet or lower portion of the body
- anterior: toward the front of the body
- posterior: toward the back
- dorsal: toward the back
- ventral: toward the front/belly
- medial: toward the middle or center of the body or body part
- lateral: on or closer to the side
- proximal: nearer the point where a limb attaches to the body
- distal: farther from the point where a limb attaches to the body
- bilateral: pertaining to both sides of the body or structure
- unilateral: pertaining to only one side of the body or structure
- deep: toward the interior
- superficial: near the surface
- parietal: the wall of a cavity
- visceral: refers to the internal organs
- supine: lying face up or palms up
- prone: lying face down or palms down

STRAND 4

Students will define medical terms that are commonly used in relation to the Integumentary System.

Standard 1

Interpret and apply identified medical abbreviations related to the Integumentary System.

- CA - cancer
- sq/subcu/subq - subcutaneous

Standard 2

Define prefixes related to the Integumentary System.

- sub-: below, under
- subcu-: subcutaneous; under the skin

Standard 3

Define word roots/combining forms related to the Integumentary System.

- adip/o: fat
- albino: white
- aut/o: self
- carcin/o: cancer of epithelial tissue
- chem/o: drug, chemical
- cry/o: cold
- cutane/o: skin
- cyano: blue
- dermat/o: skin
- derm/o: skin
- erythro: red
- hidr/o: sweat

- hist/o: tissue
- hom/o: same
- ichthy/o: scaly
- kerat/o: horn, hard tissue; cornea
- leuko: white
- lip/o: fat
- melano: black
- myc/o: fungus
- onych/o: nail
- pil/o: hair
- rhytid/o: wrinkle
- seb/o: sebum
- squam/o: scale
- sub: below
- trich/o: hair
- xanth/o: yellow
- xen/o: stranger; foreigner; guest
- xer/o: dry

Standard 4

Define suffixes related to the Integumentary System.

- -derma: skin
- -itis: inflammation
- -oma: tumor
- -tome: instrument to cut

Standard 5

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Integumentary System.

- biopsy: to take a section of living tissue for viewing
- cutaneous: pertaining to the skin
- cyanoderma: blue skin
- cyanosis: blue skin due to lack of oxygen
- dermatitis: inflammation of the skin
- dermatologist: one who specializes in the skin
- dermatomycosis: fungus condition of the skin
- dermatome: an instrument for cutting thin slices of skin for grafting
- diaphoresis: sweating
- epidermis: the outer layer of the skin
- erythroderma: red skin
- eczema: inflammation of the skin, causing itching and rash
- leukoderma: patches of lightened or depigmented skin
- melanoma: black tumor
- onychophagia: nail biting
- sebaceous: condition of fat or oil
- subcutaneous: under the skin
- xeroderma: dry skin

STRAND 5

Students will define medical terms that are commonly used in relation to the Skeletal System.

Standard 1

Interpret and apply identified medical abbreviations related to the Skeletal System.

- ACL: anterior cruciate ligament
- amb: ambulate, ambulatory
- B: bilateral
- Fx: fracture
- L: left
- LCL: lateral collateral ligament
- MCL: medial collateral ligament
- OA: osteoarthritis
- PCL: posterior cruciate ligament
- POLICE: protection, optimal loading, ice, compression, elevation
- R: right

- RA: rheumatoid arthritis
- RICE: rest, ice, compression, elevation
- ROM: range of motion

Standard 2

Define prefixes related to the Skeletal System.

- hemi-: one half

Standard 3

Define word roots/combining forms related to the Skeletal System.

- ankyl/o: stiff, crooked, bent
- arthr/o: joint
- articul/o: joint
- blast: embryonic; tissue building cell
- brachi/o: arm
- burs/o: bursa (fluid filled sac)
- calcane/o: calcaneus (heel bone)
- carp/o: carpals (wrist bones)
- cervic/o: neck or neck of the uterus
- chondr/o: cartilage
- clavicul/o: clavicle
- cost/o: rib
- crani/o: cranium, head, skull
- cubit/o: elbow
- dactyl/o: finger/toes
- femer/o: femur (upper leg bone)
- fibul/o: fibula (lower leg bone)
- humer/o: humerus
- hy/o: u-shaped
- ili/o: ilium (hip bone)
- ischi/o: ischium; pelvic bone
- kinesi/o: study of movement or motion
- kyph/o: abnormal curvature; hump of the spine
- lamin/o: vertebral lamina
- ligament/o: ligament
- lord/o: curve, swayback
- lumb/o: lumbar, lower back
- mandibul/o: mandible; lower jaw
- menisc/o: meniscus
- myel/o: spinal cord, bone marrow
- orth/o: straight
- oste/o: bone
- patell/o: patella
- ped: foot, child
- pelv/i: pelvis
- phalang/o: phalanges
- physi/o: physical, natural
- por/o: pore, porous
- pub/o: pubis
- scoli/o: crooked, curved
- spondyl/o: vertebrae, spine
- stern/o: sternum
- styl/o: styloid process
- synovi/o: synovial membrane, synovial fluid
- tars/o: ankle
- thorac/o: chest
- tibi/o: tibia; lower leg bone
- uln/o: ulna
- vertebr/o: vertebra, spine

Standard 4

Define suffixes related to the Skeletal System.

- -centesis: surgical puncture
- -clast: destructive cell
- -desis: surgical union
- -malacia: softening
- -physis: growth
- -poeisis: formation, production

Standard 5

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Skeletal System.

- acromegaly: enlargement of the extremities
- ankylosis: condition of crooked, bent, or stiff
- arthralgia: joint pain
- arthritis: inflammation of a joint
- arthrocentesis: surgical puncture to remove fluid from the joint

- arthrodesis: surgical union of the joint; fusing of a joint
- arthrography: the process of recording pictures of a joint
- arthroplasty: repair of a joint
- arthroscope: instrument to view a joint
- arthroscopy: procedure to view a joint
- calcaneal: pertaining to the calcaneus (heel bone)
- carpals: wrist bones
- chondrectomy: removal of cartilage
- chondrocyte: cartilage cell
- chondromalacia: softening of the cartilage
- costal: pertaining to ribs
- craniotomy: incision into the cranium/skull
- cribriform: sieve-like plate
- intracranial: within the skull
- kyphosis: abnormal curvature; hump of the spine
- laminectomy: removal/excision of the vertebral lamina
- ligament: band/sheet of connective tissue connecting 2 or more bones
- lordosis: an abnormal curvature of the lumbar spine (sway back)
- metacarpal: relating to the metacarpal bones
- metatarsal: relating to the metatarsal bones
- myelofibrosis: condition of fibers in the bone marrow
- orthopedic: branch of medicine dealing with the correction of deformities of bones or muscles
- ossicles: small bones of the middle ear
- osteoarthritis: degenerative joint disease
- osteoblast: bone-forming cell
- osteoclast: bone-destroying cell
- osteocyte: mature bone cell
- osteoma: bone tumor
- osteomalacia: softening of the bones
- osteomyelitis: inflammation of bone or bone marrow
- osteoporosis: loss of bone density
- patellar: pertaining to the patella
- scoliosis: condition of lateral curvature of the spine
- vertebral: pertaining to the vertebral column

STRAND 6

Students will define medical terms that are commonly used in relation to the Muscular System.

Standard 1

Interpret and apply identified medical abbreviations related to the Muscular System.

- ADL: activities of daily living
- AP: anterior posterior
- EMG: electromyogram: recording of the electrical activity of the muscles
- IM: intramuscular
- NSAID: nonsteroidal anti-inflammatory drug
- PT: physical therapy

Standard 2
Define prefixes related to the Muscular System.
- quadri-: four

Standard 3
Define word roots/combining forms related to the Muscular System.
- amb/i: both
- ambul/o: to walk
- aponeur/o: aponeurosis; flat sheet of connective tissue
- cry/o: cold
- dextr/o: right
- fasci/o: fascia, fibrous band
- fibr/o: fiber, fibrous
- kinesi/o: study of movement or motion
- lei/o: smooth
- my/o: muscle
- sarc/o: flesh
- taxi/a: order; coordination
- ten/o: tendon
- tend/o: tendon
- tendin/o: tendon
- therm/o: heat

Standard 4
Define core suffixes.
- -asthenia: weakness, lack of strength
- -kenesia: movement
- -spasm: involuntary contraction; twitching
- -trophy: development; nutrition

Standard 5
Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Muscular System.
- atrophy: decrease in size or mass
- bradykinesia: slow movement
- diaphragm: a dome-shaped, muscular partition separating the thorax from the abdomen
- dystrophy: bad development (muscle loss beyond normal)
- endomysium: pertaining to within the muscles
- epimysium: pertaining to on or upon the muscles
- fascia: fascia or fibrous bands of connective tissue
- fibromyalgia: pain in the muscle fibers
- myalgia: muscle pain
- myasthenia: muscle weakness
- myoma: tumor of the muscles
- myorrhexis: rupture of the muscles
- tendinitis: inflammation of the tendon
- tendinoplasty: surgical repair of the tendon

STRAND 7
Students will define medical terms that are commonly used in relation to the Nervous System.

Standard 1
Interpret and apply identified medical abbreviations related to the Nervous System.
- ASA: aspirin
- CNS: central nervous system

- CSF: cerebrospinal fluid
- CVA: cerebrovascular accident
- EEG: electroencephalogram
- HA: headache
- ICP: intracranial pressure
- LOC: level of consciousness or loss of consciousness
- LP: lumbar puncture
- TIA: transient ischemic attack

Standard 2

Define prefixes related to the Nervous System.

- af-: toward
- dys-: bad; painful; difficult
- ef-: away from
- para-: beside, beyond, near
- quadri-: four

Standard 3

Define word roots/combining forms related to the Nervous System.

- astr/o: star shaped
- cephal/o: head
- cerebell/o: cerebellum; small hind brain
- cerebr/o: brain, cerebrum; large outer brain
- crani/o: cranium, head, skull
- dendr/o: tree
- dur/o: tough
- electr/o: electricity
- encephal/o: brain
- esthes/o: feeling, sensation
- gangli/o: ganglion; mass of nerve tissue
- lob/o: brain lobe
- mening/o: meninges
- myel/o: spinal cord, bone marrow
- neur/o: nerve
- phren/o: diaphragm; mind
- poli/o: gray
- psych/o: mind
- schiz/o: split
- somat/o: body
- spin/o: spine
- vertebr/o: vertebra, spine

Standard 4

Define suffixes related to the Nervous System.

- -ferent: carry
- -glia: gluey substance
- -lepsy: seizure, attack
- -mania: madness
- -mentia: mind
- -paresis: slight paralysis
- -phasia: speech
- -phobia: irrational fear
- -plegia: paralysis

Standard 5

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Nervous System.

- aphasia: without speech
- astrocyte: star (shaped) cell
- cephalic: pertaining to the head
- cerebral: pertaining to the cerebrum
- cerebrospinal: pertaining to the brain and spinal cord
- dementia: memory impairment
- dendrite: branch of a neuron
- dysphasia: difficulty speaking
- encephalitis: inflammation of the brain
- encephalotomy: to cut into the brain
- glioma: tumor of the glial tissue of the nervous system
- hemiparesis: half (of the body) slightly paralyzed

- hemiplegia: half paralyzed (left or right side of body)
- meninges: the membranes that cover the brain and spinal cord
- meningitis: inflammation of the brain coverings (meninges)
- meningocele: herniation or protrusion of the meninges
- microencephaly: abnormally small head
- myelin: a fatty white substance that surrounds the axon of some nerve cells
- narcolepsy: sleep seizures
- neuralgia: nerve pain
- neuroglia: pertaining to nerve glue (supporting nerve cells)
- neurology: the study of nerves
- neuron: a nerve cell
- paralysis: loss of the ability to move
- paraplegia: paralysis of the legs and lower body
- quadriplegia: paralysis of four (referring to the paralysis of all four limbs)
- radiculopathy: nerve root disease
- schizophrenia: condition of split mind
- somatic: referring to the body

STRAND 8

Students will define medical terms that are commonly used in relation to the Special Senses.

Standard 1

Interpret and apply identified medical abbreviations related to the Special Senses.

- AD: right ear
- AS: left ear
- AU: both ears
- ENT: ear, nose, and throat
- LASIK: laser assisted in situ keratomileusis
- OD: overdose or right eye
- OM: otitis media
- OS: left eye
- OU: each eye
- TM: tympanic membrane
- VA: visual acuity

Standard 2

Define prefixes related to the Special Senses.

- dipl-: double
- eso-: inward
- exo-: outward
- hyper-: excessive, above normal

Standard 3

Define word roots/combining forms related to the Special Senses.

- acoust/o: hearing
- audi/o: hearing, sound
- aur/i: ear
- blephar/o: eyelid
- chrom/o: color
- chromat/o: color
- conjunctiv/o: conjunctiva; lining of the surface of the eye
- core/o: pupil
- cor/o: pupil
- corne/o: cornea
- dacry/o: tears, tear duct
- dipl/o: double
- gloss/o: tongue
- irid/o: iris
- kerat/o: cornea
- lacrim/o: tears
- medi, media: middle
- myring/o: tympanic membrane
- ocul/o: eye
- olfact/o: sense of smell
- ophthalm/o: eye

- opt/o: vision
- or/o: mouth
- ot/o: ear
- phon/o: sound or voice
- phot/o: light or related to light
- presby: old age
- retin/o: retina
- scler/o: white of the eye or hardening
- rhin/o: nose
- son/o: sound
- ton/o: tone, tension, pressure
- tympan/o: eardrum
- vitre/o: vitreous humor of eye

Standard 4

Define suffixes related to the Special Senses.

- -acusis: hearing
- -opia: vision
- -ptosis: prolapse, downward displacement

Standard 5

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Special Senses.

- acoustic: pertaining to hearing
- auditory: pertaining to hearing
- auricle: pertaining to the (outer) ear
- binocular: pertaining to two eyes
- blepharitis: inflammation of the eyelid(s)
- blepharoplasty: surgical repair of the eyelid(s)
- blepharoptosis: drooping of the eyelids
- blepharospasm: involuntary contraction of the eyelid
- cataract: clouding of the lens of the eye
- conjunctivitis: inflammation of the conjunctiva
- diplopia: double vision
- exophthalmic: pertaining to eyes slightly out
- hyperopia: far vision (referring to far-sighted)
- intraocular: pertaining to within the eye
- iridectomy: removal of the iris
- keratitis: inflammation of the cornea
- keratometry: measurement of the cornea
- keratoplasty: repair of the cornea (corneal transplant)
- keratotomy: incisions into the cornea (correct mild to moderate myopia)
- lacrimal: pertaining to the tear ducts
- myopia: near-sightedness
- ophthalmologist: a specialist of the eye
- ophthalmoplegia: paralysis of the eye muscles
- ophthalmoscope: instrument for examining the interior of the eye
- optic: pertaining to the eye or vision
- optometry: the profession of examining the eyes for visual defects and prescribing corrective lenses
- orbital: pertaining to the eye cavity
- otitis media: middle ear infection
- otosclerosis: hardening of the bony tissue of the ear
- otoscope: instrument to view the ear
- presbycusis: hearing loss due to aging

STRAND 9

Students will define medical terms that are commonly used in relation to the Endocrine System.

Standard 1

Interpret and apply identified medical abbreviations related to the Endocrine System.

- BS - blood sugar
- DM - diabetes mellitus
- FBS - fasting blood sugar
- GTT: glucose tolerance test
- IDDM - insulin-dependent diabetes mellitus (Type 1)
- NIDDM - non-insulin-dependent diabetes mellitus (Type 2)

Standard 2

Define prefixes related to the Endocrine System.

- hypo-: under, below, deficient

Standard 3

Define word roots/combining forms related to the Endocrine System.

- acr/o: extremity
- aden/o: gland
- adren/o: adrenal gland
- cortic/o: cortex or outer layer of a gland
- dips/o: thirst
- endocrine/o: to secrete within the blood or the endocrine system
- ex/o: without
- gluc/o: sugar, sweet, glucose
- glyc/o: sugar, sweet
- hormon/o: to excite (chemical messengers); urging on
- pancreat/o: pancreas
- pineal/o: pineal gland
- pituit/o: pituitary gland
- thry/o: thyroid

Standard 4

Define suffixes related to the Endocrine System.

- -crine: to secrete
- -tropic: influencing, affect

Standard 5

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Endocrine System.

- adrenalectomy: removal of the adrenal gland
- adrenocorticohyperplasia: increased development of the adrenal cortex
- adrenocorticotropic: pertaining to influencing the adrenal cortex
- adrenopathy: disease of the adrenal gland
- endocrine: to secrete within the blood or the endocrine system
- endocrinologist: one who studies the endocrine system
- endocrinopathy: disease(s) of the endocrine glands or system
- euthyroid: resembling normal thyroid function
- exocrine: to secrete without (outside in ducts or small tubes)
- glucocorticoid: “resembling sugar from the cortex.” (hormones)
- gonadotropic: pertaining to influencing the reproductive organs
- gonads: reproductive organs
- hyperglycemia: high levels of sugar in the blood
- hyperparathyroidism: condition of excessive parathyroid secretion
- hyperthyroidism: condition of excessive thyroid secretion
- hypoglycemia: low levels of sugar in the blood

- hypothyroidism: condition of low thyroid secretion
- parathyroidoma: mass or tumor in the parathyroid
- polypagia: excessive hunger
- polyuria: excessive urine production
- thyroidectomy: removal of the thyroid gland

STRAND 10

Students will define medical terms that are commonly used in relation to the Cardiovascular System.

Standard 1

Interpret and apply identified medical abbreviations related to the Cardiovascular System.

- av/AV: atrioventricular
- BP: blood pressure
- CABG: coronary artery bypass graft
- CBC: complete blood count
- CHF: congestive heart failure
- CPR: cardiopulmonary resuscitation
- DNR: do not resuscitate
- DOA: dead on arrival
- DVT: deep vein thrombosis
- ECG/EKG: electrocardiogram
- Hct: hematocrit
- Hgb/Hb: hemoglobin
- HR: heart rate
- HTN: hypertension; head and neck tumors
- IV: intravenous
- MI: myocardial infarction
- P: pulse
- RBC: red blood cell or red blood count
- RRR: regular rate & rhythm (refers to heart)
- SA: sinoatrial node
- WBC: white blood cell

Standard 2

Define prefixes related to the Cardiovascular System.

- bi-: two
- brady-: slow
- tachy-: rapid or fast
- tri-: three

Standard 3

Define word roots/combining forms related to the Cardiovascular System.

- angi/o: vessel
- aort/o: aorta; largest artery
- arteri/o: artery
- ather/o: fatty plaque
- atri/o: atrium; chamber
- cardi/o: heart
- coron/o: heart
- ech/o: reflected sound
- hem/o: blood
- hemat/o: blood
- kal/i: potassium
- phleb/o: vein
- plasm/o: liquid component of blood
- sanguin/o: blood
- sept/o: septum; wall dividing two cavities
- ser/o: fluid part of blood
- sphygm/o: pulse
- steth/o: chest
- thromb/o: clot
- vas/o: vessel, duct
- ven/o: vein
- ventricul/o: ventricle

Standard 4

Define suffixes related to the Cardiovascular System.

- -aphresis: removal or separation
- -crit: to separate
- -emia: condition related to blood
- -fuge: expels or drives away
- -philia: love or affinity for
- -stasis: state of stopping or stagnation

Standard 5

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Cardiovascular System.

- anemia: without blood (describe a lack of red blood cells)
- angiocardiography: the process of recording pictures of heart and vessels
- angioma: tumor of a vessel
- angioplasty: repair of a vessel
- aortogram: picture (x-ray) of the aorta
- arteriography: the process of recording pictures of arteries
- arteriorrhexis: rupture of an artery
- arteriosclerosis: hardening of an artery
- atherectomy: removal of the fatty plaque
- atherosclerosis: condition of hardening (blood vessels) due to fatty plaque
- atrioventricular: pertaining to the atria and the ventricles
- bradycardia: slow heart beat (usually less than 60 beats per minute)
- cardiac: pertaining to the heart
- cardiodynia: pain of the heart
- cardiologist: a specialist of the heart
- cardiology: study of the heart
- cardiomegaly: enlargement of the heart
- cardiomyopathy: disease of the heart muscle
- coronary: pertaining to the heart
- echocardiogram: using ultrasound to record or visualize cardiac structures
- electrocardiogram: recording of the heart's electrical pattern
- electrocardiograph: the machine that records the heart's electrical pattern
- electrocardiography: the process of recording the heart's electrical pattern
- endocarditis: inflammation with the heart (inner lining of the heart)
- endocardium: pertaining to the inner (layer) of the heart
- erythrocyte: red (blood) cell
- erythropoiesis: production of red (production of red blood cells)
- hematemesis: bloody vomit
- hematocrit: to separate blood
- hematocytoblast: blood developing cell (forming each type of blood cells)
- hematologist: one who specializes in the study of blood
- hematology: the study of blood
- hematoma: blood tumor or mass (bruise or ecchymosis)
- hematopoiesis: the production of blood or blood cells
- hematuria: blood in the urine
- hemolysis: the destruction of blood
- hemophilia: pertaining to an affinity or love of blood
- hemorrhage: blood bursting forth
- hemostasis: blood standing still (control of bleeding)
- ischemia: deficiency of blood (to a muscle or an organ)
- leukemia: condition of white blood (cancer of the blood)
- leukocyte: white cell or white blood cell
- leukocytosis: condition of white cells
- leukopenia: deficiency of white blood cells
- pericarditis: inflammation around the heart

- pericardium: around the heart
- pericardiostomy: formation of an opening in the pericardium
- polycythemia: blood condition of many cells (overproduction of blood)
- tachycardia: rapid heart beat (usually above 100 beats per minute)
- thrombocyte: clotting cell (platelets)
- thrombocytopenia: deficiency of clotting cells
- thrombosis: condition of a clot/clots/clotting

STRAND 11

Students will define medical terms that are commonly used in relation to the Lymphatic System.

Standard 1

Interpret and apply identified medical abbreviations related to the Lymphatic System.

- AIDS: Acquired Immunodeficiency Syndrome
- HIV: Human Immunodeficiency Virus
- HIB: Haemophilus influenzae type b
- HBV: Hepatitis B virus
- EBV: Epstein-Barr virus

Standard 2

Define word roots/combining forms related to the Lymphatic System.

- aden/o: gland
- immun/o: immunity; protected from
- lymph/o: lymph, lymph tissue
- splen/o: spleen
- staphyl/o: grape-like clusters
- strept/o: twisted chains
- thym/o: thymus gland
- tonsill/o: tonsils
- tox/o: poison
- toxic/o: poison

Standard 3

Define suffixes related to the Lymphatic System.

- -edema: swelling
- -pathy: disease or condition

Standard 4

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Lymphatic System.

- lymphadenitis: inflammation of the lymph gland (the lymph node)
- lymphadenogram: recording (or x-ray) of the lymph gland (or node)
- lymphadenopathy: disease of the lymph gland (or node)
- lymphangiography: the process of recording pictures of lymph vessels
- lymphedema: swelling of the lymphatic system or vessels
- lymphocyte: lymph cell (a type of white blood cell)
- lymphoma: tumor of the lymph (or lymphatic system)
- lymphotoxin: a poison produced by lymphatic cells
- lysosomes: destroying bodies (organelles of the cell)
- macrophage: large eating cell (integral part in the immune response)

STRAND 12

Students will define medical terms that are commonly used in relation to the Respiratory System.

Standard 1

Interpret and apply identified medical abbreviations related to the Respiratory System.

- ABG: arterial blood gas
- CO_2: carbon dioxide
- COPD: chronic obstructive pulmonary disease
- CXR: chest x-ray
- O_2: oxygen
- PE: pulmonary embolism
- R: respirations
- SIDS: sudden infant death syndrome
- SOB: shortness of breath
- TB: tuberculosis
- TCDB: turn, cough, deep breath
- URI: upper respiratory infection

Standard 2

Define prefixes related to the Respiratory System.

- eu-: normal or good

Standard 3

Define word roots/combining forms related to the Respiratory System.

- aer/o: air
- alevol/o: alveolus; small hollow cavity
- bronch/i: bronchus, airway
- bronchiol/o: bronchiole; small tubes of the bronchus
- epiglott/o: epiglottis; cartilage covering the larynx; voice box
- laryng/o: larynx, voice box
- nas/o: nose
- or/o: relating to the mouth
- ox/i: pertaining to oxygen
- pharyng/o: pharynx, throat
- phren/o: mind or diaphragm
- pleur/o: pleura
- pneum/o: lung or air
- pneumon/o: lung or breathing
- pulmon/o: pertaining to the lungs
- rhin/o: nose
- sin/o: sinus
- spir/o: respiration
- stomat/o: mouth or oral cavity
- trache/o: trachea, windpipe

Standard 4

Define suffixes related to the Respiratory System.

- -capnia: carbon dioxide
- -ectasis: dilation, expansion
- -oxia: oxygen
- -pnea: breathing

Standard 5

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Respiratory System.

- apnea: without breath or without breathing
- asthma: condition marked by spasms in the bronchi
- atelectasis: partial or complete collapse of the lung
- bronchiolitis: inflammation of the bronchioles
- bronchitis: inflammation of the bronchi
- bronchospasm: sudden involuntary contraction of the bronchi
- dyspnea: difficulty breathing
- emphysema: a condition in which the air sacs of the lungs are damaged and enlarged, causing breathlessness
- epiglottis: a flap in the throat that keeps food from entering the windpipe and lungs
- eupnea: normal breathing

- hypercapnia: carbon dioxide level above normal
- hyperpnea: increased breathing
- hypopnea: decreased breathing
- laryngitis: inflammation of the larynx (voice box)
- larynogopharynx: larynx, pharynx (region of the pharynx behind the larynx)
- orthopnea: difficulty breathing when lying down
- phrenic: pertaining to the diaphragm
- pleuritis: inflammation of the pleura
- pleurodynia: pain of the pleura
- pneumonectomy: removal of the lung
- pneumothorax: air within the pleural space causing lung to collapse
- rhinoplasty: surgical repair of the nose
- rhinorrhea: nose discharge; runny nose
- sinusitis: inflammation of the sinuses
- spirometer: instrument to measure breathing
- tachypnea: rapid breathing
- trachea: pertaining to the trachea or windpipe
- tracheotomy: incision into the windpipe or trachea

STRAND 13

Students will define medical terms that are commonly used in relation to the Digestive System.

Standard 1

Interpret and apply identified medical abbreviations related to the Digestive System.

- ac: before meals
- BM: bowel movement
- GERD: gastroesophageal reflux disease
- GI: gastrointestinal
- LLQ: left lower quadrant
- LUQ: left upper quadrant
- Na: sodium
- NPO/npo: nothing by mouth
- N & V: nausea and vomiting
- R: rectal
- RLQ: right lower quadrant
- RUQ: right upper quadrant

Standard 2

Define prefixes related to the Digestive System.

- aliment-: food
- dont-: tooth

Standard 3

Define word roots/combining forms related to the Digestive System.

- abdomin/o: abdomen
- an/o: anus
- append/o: to hang from, appendix
- azot/o: nitrogen; urea nitrogen waste
- bil: bile; fluid secreted by the liver
- cec/o: cecum
- celi/o: abdomen
- cheil/o: lip
- chol/e: bile, gall
- cholangi/o: bile vessel
- cholecyst/o: gallbladder
- choledoch/o: common bile duct
- cari: decay, in a tooth
- col/o: colon, large intestine
- cyst/o: bladder
- dent/o: tooth
- dips/o: thirst
- duoden/o: duodenum (first part of small intestine)
- enter/o: intestines (usually small intestine)

- gastr/o: stomach
- gingiv/o: gums
- gloss/o: tongue
- hepat/o: liver
- herni/o: hernia
- ile/o: ileum (last part of small intestine)
- jejun/o: jejunum (middle part of small intestine)
- lapar/o: abdomen, abdominal wall
- lingu/o: tongue
- odont/o: tooth
- pancreat/o: pancreas
- proct/o: anus and rectum
- pylor/o: pylorus, opening from stomach into duodenum
- sial/o: saliva, salivary gland
- sigmoid/o: sigmoid colon

Standard 4

Define suffixes related to the Digestive System.

- -ase: enzyme
- -dipsia: thirst
- -emesis: vomiting
- -lith: stone
- -tripsy: surgical crushing

Standard 5

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Digestive System.

- achlorhydria: absence of hydrochloric acid in the gastric secretions
- aphagia: inability to swallow
- alimentary: pertaining to food
- appendectomy: removal of the appendix
- biliary: pertaining to bile
- cheilorrhaphy: surgical repair of the lip
- cholecystectomy: removal of the gallbladder
- cholecystitis: inflammation of the gallbladder
- cholelithiasis: condition of gallstones
- colonoscopy: process of viewing the colon
- colostomy: creation of a new opening in the large intestine
- diarrhea: flowing through
- dyspepsia: difficult (painful or bad) digestion
- dysphagia: difficulty swallowing or eating
- enteritis: inflammation of the small intestine
- gastroenterologist: one who studies the stomach and small intestines
- gastrojejunostomy: creation of an artificial opening between stomach and jejunum
- glossopharyngeal: pertaining to the tongue and pharynx
- hematemesis: bloody vomit
- hepatitis: inflammation of the liver
- hiatal: pertaining to an opening
- ileocecal: pertaining to the ileum and the cecum
- ileostomy: creation of an artificial opening in the ileum
- laparotomy: process of cutting into the abdomen
- pancreatitis: inflammation of the pancreas
- stomatitis: inflammation of the mouth
- sigmoidoscopy: process of viewing the sigmoid colon

STRAND 14

Students will define medical terms that are commonly used in relation to the Urinary System.

Standard 1

Interpret and apply identified medical abbreviations related to the Urinary System.

- BUN: blood urea nitrogen
- GU: genitourinary
- I&O: intake and output
- IVP: intravenous pyelogram
- KUB: kidney, ureter, bladder
- UA: urinalysis
- UTI: urinary tract infection

Standard 2

Define prefixes related to the Urinary System.

- dia-: through, across
- poly-: many, much
- supra-: above; excessive; superior

Standard 3

Define word roots/combining forms related to the Urinary System.

- albumin/o: albumin; simple protein
- azot/o: nitrogenous compounds
- cyst/o: bladder, fluid filled sac
- glomerul/o: glomerulus
- glycos/o: sugar, sweet
- nephr/o: kidney
- noct/o: night
- olig/o: scanty
- pyel/o: renal pelvis
- ren/o: kidney
- ur/o: urine
- ureter/o: ureter
- urethr/o: urethra
- urin/o: urine

Standard 4

Define suffixes related to the Urinary System.

- -ectasia: expansion, dilation or stretching
- -uria: urine or urination

Standard 5

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Urinary System.

- albuminuria: albumin in the urine
- anuria: no urine
- antidiuretic: pertaining to against urination
- azotemia: condition of nitrogen in the blood
- cystitis: inflammation of the urinary bladder
- cystocele: protrusion of the urinary bladder
- cystoscopy: procedure to view the urinary bladder
- cystourethroscopy: procedure to view the urinary bladder and the urethra
- dialysis: the passage of a solute through a membrane
- diuresis: condition of urinating
- dysuria: painful or difficult urination
- glomerulonephritis: inflammation of the glomerulus and the nephron
- glycosuria: sugar in the urine
- nephrectomy: removal of the kidney
- nephritis: inflammation of the kidney

- nephrologist: a specialist of the kidney
- nephrology: study of the kidney
- nephromalacia: softening of the kidney
- nephromegaly: enlargement of the kidney
- nephropathy: disease of the kidney
- nephropexy: surgical fixation of the kidney
- nephroptosis: drooping or dropped position of the kidney
- nephrosis: condition of the kidney
- nocturia: night time urination
- oliguria: scanty urination
- polyuria: excessive urination
- pyelonephritis: inflammation of the kidney due to bacterial infection
- urethritis: inflammation of the urethra

STRAND 15

Students will define medical terms that are commonly used in relation to the Reproductive System.

Standard 1

Interpret and apply identified medical abbreviations related to the Reproductive System.

- DRE: digital rectal examination
- GYN/gyn: gynecology
- HPV: Human papilloma virus
- L & D: labor and delivery
- LMP: last menstrual period
- NB: newborn
- OB/ob: obstetrics
- PMS: pre-menstrual syndrome
- STD: sexually transmitted disease
- STI: sexually transmitted infection
- VBAC: vaginal birth after cesarean section

Standard 2

Define prefixes related to the Reproductive System.

- ectop-: out of place
- meso-: middle

Standard 3

Define core word roots/combining forms related to the Reproductive System.

- amni/o: amnion; inner fetal membrane
- andr/o: male
- arch/e: beginning or first
- balan/o: penis
- colp/o: vagina
- chori/o: chorion; outer fetal membrane
- crypt/o: hidden
- derm/o: skin
- epididym/o: epididymis
- episi/o: vulva
- genit/o: reproductive organs
- gonad/o: gonads; sex glands
- gravid/o: pregnancy
- gyn/o: female
- gynec/o: female
- hymen/o: hymen
- hyster/o: uterus
- lact/o: milk
- mamm/o: breast
- mast/o: breast
- men/o: menstruation
- metr/o: uterus
- oophor/o: ovary
- orchi/o: testes
- orchid/o: testes
- ovari/o: ovary; female sex gland
- perine/o: perineum; pelvis floor
- prostat/o: prostate gland
- salping/o: uterine tube
- sperm: male reproductive cells; gametes

- spermat/o: spermatozoa, sperm cells
- test/o: testis, testicle
- testicul/o: testicle
- uter/o: uterus
- vagin/o: vagina
- vesic/o: bladder
- vulv/o: vulva

Standard 4

Define the meanings of a set of core suffixes related to the Reproductive System.

- -cyesis: pregnancy
- -natal: birth
- -partum: childbirth, labor
- -phylaxis: protection
- -tocia: labor

Standard 5

Identify and apply the terms that describe diseases, disorders, procedures, treatments, and diagnostic tests associated with the Reproductive System.

- amenorrhea: absence of menstrual flow
- androgen: male producing
- andrology: study of males (usually pertaining to diseases)
- android: resembling man
- ananthropy: having the characteristics of a man
- anovulation: absence of ovulation
- balanitis: inflammation of the penis
- balanoplasty: surgical repair of the penis
- circumcise: to cut around
- colporrhaphy: repair of the vagina
- cryptorchidism: hidden or undescended testes
- dystocia: difficult or prolonged labor and delivery
- episiotomy: incision into the perineum
- genital: pertaining to the reproductive organs
- gravida: number of pregnancies a woman has had
- gynecologist: a specialist of female disorders
- gynecology: study of the female and female disorders
- hymenotomy: incision into the hymen
- hysterectomy: removal of the uterus
- hysterogram: picture (or x-ray) of the uterus
- hysteroscope: instrument to view within the uterus
- lactation: milk producing
- mammogram: picture (x-ray) of the breast
- mastopexy: surgical fixation of the breast
- menarche: the first occurrence of menstruation
- menopause: cessation or end of the menstrual cycle
- menstrual: pertaining to the menstrual cycle or menses
- myometrium: pertaining to the muscular uterine tissue
- oocyte: a cell in the ovary that may undergo meiotic division to form an ovum
- oophoritis: inflammation of an ovary
- oophoropathy: disease of the ovaries
- orchidalgia: pain in the testis
- orchiectomy: removal of one or both testicles
- orchiepididymitis: inflammation of the testis and epididymis
- orchiopathy: disease of the testis

- orchitis: inflammation of one or both testes
- parturition: childbirth
- perineum: the area between the anus and the genitals
- prostatectomy: removal of the prostate gland
- prostatitis: inflammation of the prostate gland
- salpingectomy: removal of a fallopian tube
- salpingitis: inflammation of the fallopian tubes
- seminoma: a tumor of the testis
- spermatocyte: sperm cell
- testicular: pertaining to the testes
- vaginal: pertaining to the vagina
- vaginoperineoplasty: repair of the vagina and the perineum

Performance Skills

- Interpret and extract information from realistic medical documents.
- Use reputed medical reference resources to find related information. (e.g. medical reference websites or hardbound medical reference books.)
- Apply medical terminology to a real-life setting. (i.e. define medical terms heard in a television show or read in an article.)
- Explain the contents of a medical document in layman's terms to an individual. (e.g. progress notes, operative report, discharge summary, radiology report, etc.)

Durable Skills

Students will develop professional and interpersonal skills needed for success in the healthcare industry. Identify and apply durable skills needed in the workplace.

- Professionalism
- Collaboration
- Communication
- Leadership
- Innovation
- Adaptability

Test Name	Test #	Industry Test Points by Strand															Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	1o	11	12	13	14	15		
Medical Terminology	704	12	4	5	3	3	3	3	4	3	9	2	4	4	4	4	66	60

Hospitality, Events and Tourism

Culinary Arts		
Course Code	**Course**	**Changes**
34.01.00.00.172	Culinary 2	General clarification and structure.
		Addition to include top 9 allergens
		Addition of Strand on Professional Culinary Organization and Practices
34.01.00.00.174	Culinary 3	General formatting changes
		Clarification/characteristics and definitions for menus, menu pricing, grains, pasta, yeast breads, pies
		Addition of strand on cooking outdoors
34.01.00.00.176	Baking & Pastry	General formatting changes
		Addition of professional Bakers Formula
		Clarification/key characteristics, definitions and examples for cookies, yeast bread, fillings, pastry doughs and cakes
		Addition of allergens associated with baking and pastry; flours & dairy
34.01.00.00.255	Prostart 1	Reorganization of strands and standards
		Consideration of previous(last year) board suggestions
34.01.00.00.257	Prostart 2	Reorganization of strands and standards
		Consideration of previous(last year) board suggestions

STRANDS AND STANDARDS
CULINARY 2

Learning that works for Utah
CTE®

Course Description

This course focuses on implementing and practicing safety and sanitation procedures, as well as understanding the use and care of commercial food service equipment. Students will explore quantity food preparation as it relates to catering, bakery, restaurant, hospitality, and quick service business operations. The curriculum covers professional culinary organization and practices, knife skills, food service equipment, industry history and trends, cooking techniques, culinary math, and the production of stocks, soups, and sauces. It also includes an understanding of salads, appetizers, and sandwiches, and delves into career opportunities, customer service, and dining room management.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	34.01.00.00.172
Concurrent Enrollment Core Code	N/A
Prerequisite	Foods and Nutrition; Culinary 1
Skill Certification Test Number	345
Skill Certification Cut Score	**75%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Family Consumer Sciences CTE/General
Endorsement 2	Culinary Arts

Updated: August 2025

STRAND 1

Connect workplace safety, food safety, and sanitation as applied to food production.

Standard 1

Apply established safety rules and guidelines in a work environment.

- Identify prevention, protocol, and treatment for cuts.
  - Prevention
    - Use sharp knives; dull knives are more dangerous
    - Hold the knife correctly; using the claw hand position on the guide hand.
    - Use a stabilized cutting board.
    - Hold onto the knife handle while cleaning, do not soak.
  - Protocol
    - Clean and sanitize the affected area and equipment as soon as possible.
  - Treatment
    - Minor cuts: clean wound, apply bandage, and wear gloves.
    - Severe cuts: apply pressure and seek medical attention.
- Identify prevention, protocol, and treatment for fires, chemical and heat-related incidents.
  - Prevention
    - Avoid flammable materials or clothing on or near the range.
    - Turn handles away from the front of the range.
    - Lift lids of hot foods away from you.
    - Use the dry side of towels, hot pads, or oven mitts for handling hot baking pans.
    - Keep equipment clean.
    - Keep chemicals away from food.
  - Protocol
    - To extinguish a fire, use the correct fire extinguisher. (A, B, C, or K)
    - To extinguish a grease fire, cover/smother the pan, or pour baking soda/salt. Avoid water, flour or sugar on grease fires.
    - Follow manufacturer directions for all chemical use and storage, do not mix chemicals.
    - Chemical incident see Safety Data Sheet (SDS) for medical treatment and fire suppression.
  - Treatment
    - First-Degree Burn and Second-Degree Burn: immerse burn in cool water or use cool compress for 10-15 minutes.
    - Third Degree Burn: seek medical treatment
    - For Chemical Burn: seek medical treatment or call poison control.
- Identify prevention, protocol and treatment for breaks, strains and sprains.
  - Prevention
    - Keep floors clean and dry.
    - Post caution signs for wet floors.
    - Store heavy items on lower shelves.
    - Use ladders or step stools appropriately.
    - Lift heavy items appropriately.
    - Wear non-slip shoes.
  - Treatment
    - Seek medical attention.

Standard 2

Identify health and hygiene requirements for food handling.

- Practice proper hand washing.
  - Wash hands with soap and warm water for at least twenty seconds, and dry with a single-use paper towel.
  - Wash hands before and after handling raw meat, poultry, or eggs.
  - Wash hands after using the restroom, sneezing, coughing, touching hair, face or phone.
- Identify appropriate clothing and hair restraints.
  - Appropriate clothing is clean and may include a chef coat, apron, or other uniform.
  - Cover and tie back hair with appropriate hair restraints before working with food.
- When tasting foods, always use a clean spoon and use only once.
- Discuss the appropriate use of gloves.
  - Single-use gloves only.
  - Wash hands before putting on gloves.
  - Change gloves when they get dirty, torn, or changing tasks.
  - Wear gloves when handling ready-to-eat (RTE) foods.
  - Wear gloves and bandage for an open cut or wound.
- Any activity involving eating, drinking, smoking/vaping, or chewing gum needs to occur in a designated area away from food preparation areas.

Standard 3

- Identify the steps in the flow of food and the importance of a Hazard Analysis Critical Control Point (HACCP) system.
- Identify the flow of food through the operation, it begins when you buy the food and ends when you serve it. The purpose of the flow of food is to identify critical control points (CCPs) where food can either experience cross-contamination or time/temperature abuse.
  - Purchasing
  - Receiving
  - Storing
  - Preparation
  - Cooking
  - Holding (hot/cold)
  - Cooling
  - Reheating
  - Serving

Explain the purpose of the Hazard Analysis Critical Control Point (HACCP) system

- To ensure keeping food safe through a system of identifying and monitoring critical control points.
  - Seven HACCP Principles
    - Conduct a hazard analysis
    - Determine CCPs
    - Establish Critical limits
    - Establish Monitoring Procedures
    - Identify Corrective Action
    - Verify that the system works
    - Establish procedures for record-keeping and documentation
- Discuss methods of purchasing, receiving, and storage.
  - Purchase from an approved reputable vendor.
  - FIFO (first-in-first-out) rule
    - (i.e., the food that has been in the holding area the longest will be used first).

    - Store food and cleaning supplies separately.
- Ensure refrigerator and freezer temperatures are refrigerator: 41°F or lower; freezer: 0°F or lower.

Standard 4

Identify the factors contributing to food-borne contamination, illness, and prevention strategies.

- A foodborne illness is a disease transmitted to people by food.
- A food-borne illness outbreak occurs when two or more people get the same illness after eating the same food and is documented by local health authorities.
- Discuss the three types of food contamination hazards.
    - Physical - hair, glass, metal shards, fingernails.
    - Chemical - cleaning supplies and pesticides.
    - Biological - harmful micro-organisms (pathogens)
        - Pathogens are the greatest threat to food safety.
        - They include certain viruses, parasites, fungi and bacteria some plants, mushrooms and seafood carry harmful toxins and poisons that are included in this group of pathogens.
- Identify the four types of pathogen contaminants
    - Bacteria - tiny single-cell micro-organisms including Salmonella Typhi, Nontyphoidal Salmonella, Shigella, and E-coli.
        - General conditions for bacteria growth include Food, Acidity, Time, Temperature, Oxygen, and Moisture(FAT TOM).
        - Attention to time, temperature and hand washing is critical to reduce the spread of illness.
    - Viruses - simple organisms responsible for the majority of foodborne illnesses – Norovirus, and Hepatitis A. The general conditions for virus growth is an infected individual.
        - Attention to personal hygiene is critical to reduce the spread of viruses.
        - Symptoms include mild fever, vomiting, headache, abdominal pain/cramps, and jaundice.
- Parasites - Organisms that must live in or on a host to survive; ex: Giardia
    - The majority of parasites come from contaminated water or fish from unsafe sources or raw and undercooked fish.
- If serving raw or undercooked fish it must be purchased as sushi-grade fish, which has been frozen at correct temperatures.
    - Attention to personal hygiene, purchasing from reputable suppliers, and cooking to correct minimum internal temperatures minimizes the spread of parasites.
    - Symptoms include tingling in the throat, coughing up worms, fever, diarrhea, nausea and abdominal cramps, and weight loss.
- Fungi - spore-producing organisms including yeast and mold. Typically, visible on spoiled food.
    - Some molds can produce toxins, such as aflatoxins. Mold can grow under any conditions but grow well in acidic food with little moisture. (i.e. jam/jelly or salty meats)
    - Yeasts can spoil foods quickly signs of spoilage can include a smell or taste like alcohol and may look like white or pink discoloration or slimy.
    - Not all molds and yeasts are bad; ex: cheese, yogurt, and breads.
    - Found in air, soil, plants, water, and some food.
    - Thoroughly inspect food before consuming it reduces the spread of fungus.
    - Symptoms include fever, diarrhea, nausea, and abdominal cramps

- Discuss prevention strategies.
  - Controlling Time and Temperatures
    - In cold storage, place ready-to-eat (RTE) foods on top and uncooked animal products toward the bottom according to cooking temperature.
    - All TCS (Time and Temperature Control for Safety) foods need to be covered and stored in the refrigerator with a label including a use-by date, stored at 41°F or lower, if produced on site for no more than 7 days.
    - Food should not be in the Danger Zone (the temperature range of 41-135°F), for longer than 4 hours total from the start of preparation.
    - The critical danger zone is 70-125°F in this range bacterial growth doubles every 20 minutes.
      - Cooling or reheating food needs to occur within a two-hour period or less if a food is within this critical danger zone.
    - Cooking to safe internal temperatures; be sure to use a clean and sanitized thermometer.
      - Whole cuts of meat seafood, pork, beef, veal, lamb—145°F (for a minimum of 15 seconds)
      - Fruits, vegetables, grains, and legumes that will be hot held for service cook - 135 °F
      - Commercially processed foods or ready-to-eat (RTE) foods that will be hot held for service - 135°F
      - Ground meats (pork, beef, veal, lamb) and eggs—155°F (for a minimum of 15 seconds)
      - All Poultry (whole or ground)—165°F (for a minimum of 15 seconds)
      - Reheat temp—165°F (for a minimum of 15 seconds)
      - Hold hot foods at - 135°F.
      - Hold cold foods at 41°F or lower
    - Practice proper methods for cooling foods
      - Food needs to be cooled from 135°F to 70°F within two hours and then below 41°F within four more hours.
      - Methods include ice water baths, ice paddles, blast chiller, and dividing large amounts of
      - food in small, shallow containers for quick cooling.
      - Store foods in the refrigerator and freezer so that the cool air can circulate to keep food safe. Don't cover shelves or overcrowd.
      - To prevent cross-contamination store foods in the refrigerator and freezer in the inverse order of the minimum internal cooking temperature.
      - Practice safely thawing foods, including in the refrigerator, under cold running water, in the microwave, or as part of the cooking process.
        - Cold running water should not exceed 70°F.
        - The product should not exceed 41°F internal temperature.
        - If thawing food in the microwave, cook immediately, or as a part of the cooking process.
- Preventing cross-contamination and cross-contact.
  - Cross-contamination is the unintentional transfer of pathogens from people, surfaces, or food to another.
  - Cross-contact happens when the transfer of an allergen from a food or food contact surface containing an allergen to a food that does not contain an allergen.
    - The big 9 allergens include: tree nuts, eggs, milk, soy, wheat, peanuts, fish, sesame, and shellfish
  - General food storage and preparation guidelines to ensure safe food handling.
    - Food Storage: food is 6 inches off the ground, label stored food correctly, and store ready-to-eat (RTE) food separately or above raw food.
    - Equipment Storage: Store service ware and food containers upside down on a clean, sanitized surface, and store utensils with handles up.

    - Food Preparation: clean and sanitize the work area and equipment, and wash hands between tasks.
        - When serving foods: no bare-hand contact with RTE food.
- Identify proper sanitation techniques used with tools, equipment, and surfaces.
    - Cleaning is removing visible pieces of food.
    - Sanitizing is reducing pathogens on a surface.
    - Discuss three-compartment sink dishwashing and the order used when washing and sanitizing dishes the process includes rinsing and scraping, washing, rinsing, sanitizing, and air dry.
    - Immediately clean and sanitize work surfaces

Performance Skills

Students will complete a sanitation and food safety training equivalent to or higher than that of a food handler's permit or certificate.

Durable Skills

Communication: Practice communication through one of the following activities.

- Instruct the student to prepare and deliver a short training session to their peers on a specific food safety topic. This could involve demonstrating proper handwashing techniques, explaining dish washing system for a three-compartment sink, or showing how to store food in a refrigerator to prevent raw juices from contaminating ready-to-eat foods.
- Intentionally set up a few minor, non-dangerous safety violations in the lab. For example, a chair might be blocking an exit, a knife left in a sink of soapy water, or a fire extinguisher is not easily accessible. The student's job is to conduct an audit using a provided checklist (or by creating their own) to find these hazards and have students write down each hazard and explain why it is a risk.
- The student is assigned a specific piece of equipment or an area, such as the dishwasher or a specific workstation. They must research the correct sanitation procedure and then write a clear, step-by-step standard operating procedure (SOP) brochure for that piece of equipment.

STRAND 2

Apply Professional Culinary Organization & Practices

Standard 1

Kitchen Brigade System

- Discuss the importance of the kitchen brigade system as a way to increase productivity in restaurant kitchens. While not all of the positions in a restaurant may have the exact same kitchen brigade system, it still heavily influences restaurant organization today.

The different positions in a kitchen brigade system include:

- Chef Exécutif (Executive Chef) - Strategic business decisions, creating the restaurant's menu or concept, this position does very little day-to-day cooking
- Chef de Cuisine (Head Chef) - Overseeing kitchen staff, developing recipes
- Sous Chef de Cuisine (Sous Chef) - Second in Command - Overseeing line cooks, assisting with management duties
- Aboyeur (Expediter) - Communicating between the front-of-house staff and the kitchen team
- Chef de Partie (Station Chef/Line Cook) - Chef assigned to a particular station such as saucier (sauce), entremetier (entrees), garde manger (pantry chef/cold goods), boucher (butcher), patissier (pastries/ desserts). This person does the majority of day-to-day cooking in their specific area of expertise.
- Commis Chef (Junior Chef) - Executing orders at the stations to which they're assigned
- Plongeur (Dishwasher) - Cleaning dishes and preparing them for another round of service

Standard 2

Mise En Place

Identify the importance of mise en place as a way to increase efficiency in the kitchen.

Steps to mise en place include:

1. Read the entire recipe & focus on tasks that need completion.
2. Create and use time management plans to help organize important tasks needed in the kitchen.
3. Prepare your workspace. Prepare a sanitizer bucket. Clean and sanitize work surfaces regardless of the look of the work surface.
4. Prepare the station with organized tools. Check that all equipment is clean before beginning anything else. Keep the station clean and organized throughout the cooking process. Set a bowl for trimmings as your mise en place station to minimize trips to the garbage can.
5. Gather and place ingredients and appropriate dishware in an organized manner.
6. Put ingredients away promptly to ensure food safety.
7. As you cook, organize, clean, store, and label food and products as needed as you go.

Standard 3

Professional Cookery Practices

Review professional cookery practices. (Culinary 1: Strand 3 Standard 7)

- Read the recipe all the way through and follow the directions as you cook.
- Once you have made the recipe and understand it, improve it and make it your own. Take notes as you go to make improvements for next time.
    - Respect your ingredients. Try to utilize all usable portions of meats, fruits, and vegetables.
    - Use scraps to build flavors for stocks.
    - Monitor the dish as it cooks, taste and season as needed.
    - Season in small amounts at a time.
    - Understand how flavors and taste play a role in the balance of the dish. Use your knowledge of the tastes of sweet, salty, sour, bitter, and umami to build flavor and balance your dish.
    - Discuss how temperature also plays a role in how we perceive flavor.
    - Practice patience while cooking.
    - The Maillard reaction is key to building flavor in cooking. Allow your food to brown and develop flavor if appropriate for the dish.
    - Use your senses and measure temperature to determine doneness.
    - Master the basic cooking techniques.
        - When you understand cooking techniques, you can make most dishes successful without using a recipe. Practice is key to success.

Performance Skills

Using the brigade system create a time plan for a mock/real catering opportunity that allows all food to be completed at the correct time of service.

Durable Skills

Leadership: Practice leadership through one of the following activities.

- Using the brigade system have the students in each cooking lab group create a time plan for a mock/real catering opportunity that allows all food to be completed at the correct time of service.
- Put students each in a leadership position focused on giving the food lab group instruct in different areas including;
    - A student acts as a Quality Control Manager, responsible for ensuring the final product meets professional standards.
    - A student acts as a Mise En Place Coordinator, a leadership role focused on efficiency and organization. The student is tasked with ensuring all the ingredients and equipment are prepped for an upcoming cooking lab.
    - A student takes on the role of an Executive Chef, leading a kitchen brigade to prepare a multi-component meal.

STRAND 3

Differentiate knives and food service equipment function, proper use, and care.

Standard 1

Review types of knives, understand their proper use and care, and demonstrate proper knife safety. (Culinary 1 Strand 3 Standard 1)

- Types of knives including chef, boning, paring, and serrated.
- Correct holding technique, sharpening, washing and storing.

Standard 2

Review and demonstrate different knife cuts, including: (Culinary 1 Strand 3 Standard 2)

- Batonnet—1/4 x 1/4 x 2-3 inch
- Julienne—1/8 x 1/8 x 1-2 inch, fine julienne- 1/16 x 1/16 x 1-2 inch
- Brunoise—1/8 x 1/8 x 1/8 inch
- Dice, small—1/4 x 1/4 x 1/4 inch; medium—1/2 x 1/2 x 1/2 inch; large—3/4 x 3/4 x 3/4 inch
- Chiffonade—stack leaves, roll, and slice into thin shreds
- Diagonal—cut on a 45-degree angle
- Rondelle—also called coin cut
- Mince - to cut or chop into very small pieces.
- Oblique – used for long round foods (ex: carrots) of different thicknesses, should have two angled sides.

Standard 3

Identify common small ware food preparation tools, and how they are to be safely used and cleaned. (i.e. mandolin, piping tools, portion scoops, chinois, scales, ricer, rolling pins, stem and digital thermometers)

Standard 4

Identify common food preparation cookware and how they are used and cleaned (i.e. roasting pan, springform pan, dutch oven, cast iron pans/skillets, and wok)

Standard 5

Identify common kitchen equipment and how they are to be safely used and cleaned (i.e. convection oven, conventional oven, commercial dishwasher/sanitizer, ice machine, stand mixer, deep fat fryer, proofer, steam table, flat top griddle).

Standard 6

Identify common service ware and how they are to be safely used and cleaned. (i.e. hotel pans, sheet pans, chafing dishes, speed rack).

Performance Skills

Demonstrate competency with all the knife cuts listed in Strand 3 Standard 1 and describe the difference between honing and sharpening a knife.

STRAND 4

Students will explore the food service and hospitality industry; history, trends, and supply chains.

Standard 1

Identify various food service industry segments such as quick service, family dining, fine dining, casual full service, dining, fast casual dining, catering, and institutional/non-commercial food service.

- Non-commercial: healthcare, education, military, charity, and corrections.
- Commercial: restaurants, caterers, lodging, travel, concessions, and retail.
  - Quick Service: a casual dining restaurant emphasizing quick food service customer pays before eating; fast service, no table service, food can be taken out or to go, low price and a limited menu. (ex: Fast food restaurants)
  - Family Dining: Servers place all the components of a meal on the table, and everyone serves themselves, menu emphasizes families, the customer pays after eating. (ex: Cracker Barrel, Denny's, and diners)
  - Fast casual dining: A restaurant that combines the elements of fast food and casual dining; higher quality ingredients, flexible ordering, customization, moderately priced and the customer pays before eating.(ex: Café Rio, Zupas, Shake Shack, and Panera)
  - Casual full-service dining: A restaurant where the majority of menu items are made to order moderately prices, laid-back atmosphere, and table service is included. (ex: P.F. Changs, Cheesecake Factory, and Texas Roadhouse)
  - Fine Dining: A restaurant that has an elevated menu, table-side cooking, upscale atmosphere, and attentive service, often has a dress code with formal or semi-formal attire, and high-end ingredients. (ex: Ruth's Chris, Table X, Log Haven, La Caille)
  - Catering: Providing food and drink at a social event or other gathering typically as a professional service. There are two categories of catering institutional (hospitals, airlines, or food courts at universities) and social catering (weddings, corporate events, or parties)

Standard 2

Identify and discuss the history and influential chefs in the food service industry.

- Identify the role of influential chefs.
  - Marie-Antoine Careme
    - Implemented white chef coat and hats
  - Auguste Escoffier
    - Organized kitchen management or brigade system
  - Julia Child
    - Revolutionized American home cooking through television
  - Alice Waters
    - Created the farm-to-table movement and sustainable agriculture
    - Healthy food in schools
  - Jacques Pepin
    - French chef, author, cooked with Julia Child on her T.V. show and creator of Wonder flour
  - Emeril Lagasse
    - Revolutionized the food network for education and entertainment.
    - Pioneered the celebrity chef movement with an agent/manager.

Standard 3

Identify current trends and their influence on the food service industry.

- Social Media influence on food trends; not always based on culinary technique but on the latest fads/ views.
- Explore cultural influences on the food service industry such as religion, health limitations, geographical, and age.
- Food Delivery Service including DoorDash, Uber Eats, etc…
- Culinary Apps/ratings/reviews give customers the ability to voice dislikes and likes with anonymity. Has the ability to influence restaurant success.

Durable Skills

Innovation: Practice innovation through one of the following activities.

- Challenge students to innovate by applying knowledge of different restaurant segments and trends to create a brand-new dining concept
- Instruct students to innovate by applying a historical chef's philosophy to a modern food trend. Ex: The student selects an influential chef from history (e.g., Auguste Escoffier and the kitchen brigade system) and a current food trend (e.g., food delivery services). The student must propose a solution for how a chef's traditional methods could be adapted to meet the demands of the modern trend.
- Focus on innovation within a non-commercial food service segment by challenging students to use data and trends to improve an institutional catering service. EX: The student is given a scenario, such as a school cafeteria's catering service for a teachers' meeting. The student must analyze the current service and identify areas for improvement based on culinary apps and social media trends. The student's task is to redesign the catering menu and service model to be more modern and appealing.

STRAND 5

Students will apply various cooking techniques and how seasonings and flavorings create and enhance the natural flavors of food while practicing food presentation.

Standard 1

Review the various cooking techniques and how they affect food.

- Dry cooking applies heat directly such as with a flame or indirectly by surrounding food with heated air or fat. These techniques include; bake, grill, broil, roast, sauté/stir-fry, pan fry, deep fry.
- Moist cooking techniques apply heat to food by submerging it directly in hot liquid or steam. These cooking methods include; poach, simmer, boil, steam, and blanch.
- Combination (uses both dry and moist cooking methods): braise and stew.

Standard 2

Discuss cooking techniques and how heat transfer is used in each method.

- Conduction cooking is the transfer of heat from one item to another when in direct contact with each other.
  - Sauté, pan fry, or grill
- Convection cooking is the transfer of heat caused by the movement of molecules from a warmer area to a cooler one; through air, water, or fat.
  - Deep fry, boiling, or air fry
- Radiation heat cooking is the transfer of heat caused by the movement of microwave or infrared waves that is absorbed into the food.
  - Broiling, or microwaving

Standard 3

Discuss the enhancement and creation of flavor when preparing food.

- Flavor can be defined as the sensory properties of food these are perceived with; taste, aroma, temperature, appearance (including color and arrangement), and texture
  - There are five tastes sweet, sour, salty, bitter, and umami.
    - The taste umami, long recognized in Japan, and recently widely accepted by western cultures, is also called savory.
    - Seasoning enhances the flavor of food without changing the natural flavor. Seasonings are salt and monosodium glutamate (MSG).
  - Flavoring adds a new taste to food and/or alters its' natural flavors.
    - Herbs
      - The leaves, stems, and flowers of aromatic plants.
      - Available fresh and dry. When using dry in the place of fresh, one-third to one-half the amount of fresh asked for should be used.
      - Fresh herbs are usually added at the end of cooking and dried are added at the beginning.
  - Spices
    - bark, buds, fruit, roots, seeds or berries
    - Usually used in dry form, available whole or ground.
  - Vinegars
    - Sour, acidic liquid that can be used to add flavor during cooking and/or as a condiment.
    - Vinegar is often named for the ingredient it is made from:
      - Each vinegar has a distinct flavor and differing acidity.
      - Vinegar can brighten a dish; similar to an acidic fruit.
  - Extracts are concentrated flavors that are used most often in baking.

Standard 4

Elements of plating and food presentation.

- Avoid placing food on the rim or overfilling the plate, allowing for negative space.
- Avoid the use of non-edibles on the plate.
- Select a focal point and design around that element, which should be the protein in an entrée.
- Odd numbers are more pleasing than even numbers.
- Choose a variety of flavors, textures, colors, shapes, garnishes, and heights in meals.
  - Flavor: The most important component
  - Texture: Contrasting textures create an interesting experience
  - Color: Use color effectively but avoid adding it unnecessarily
  - Shape: Shapes are important for visual appeal
  - Garnish: decorative elements enhance presentation
  - Height: creates visual interest
- Consider food temperature.
- Five elements of a completed entrée plate
  - Protein
  - Vegetable
  - Starch
  - Sauce
  - Garnish

Performance Skills

Students will produce at least one dish using herbs and spices, exploring flavor profiles such as Italian, Greek, and/or Spanish (examples below).

Italian: Built upon a foundation of fresh, high-quality ingredients, with herbs & spices creating a distinct taste and aroma

- Essential Herbs: Basil, oregano, parsley, rosemary, thyme, sage, marjoram, bay leaves, garlic, red pepper flakes, olive oil, onion and capers

Greek: Characterized by its fresh, vibrant, and earthy notes, relying on quality olive oil, lemon and aromatic herbs

- Essential Herbs: Oregano, mint, dill, parsley thyme, rosemary, bay leaves, basil, garlic, onion, lemon, olive oil, cinnamon, allspice, clove, nutmeg, and fennel.

Spanish: Rich aromatic, and often a balance of earthy, savory, and sometimes smoking notes.

- Essential Herbs: A variety of types of paprika, saffron, cumin, clove, cinnamon, garlic, onion, olive oil, parsley, bay leaves, rosemary, thyme, and oregano.

Durable Skills

Adaptability: Practice adaptability through one of the following activities.

- Challenge students by providing a recipe for a common dish (e.g., roasted chicken with vegetables) and a set of instructions. Then, just before the cooking begins, introduce a complication: an essential ingredient is missing, a piece of equipment is broken, or the recipe needs to be converted to a different cooking method. The student must decide how to adapt the recipe while maintaining the desired flavor and texture. For example, if the oven is unavailable, the student must convert the roasting technique (dry heat) to a braising or pan-frying technique (combination/dry).
- Instead of the standard plates, provide an unusual serving vessel (e.g., a small cup, a wide, shallow bowl, or a small slate board). The student must use their knowledge of plating elements (color, texture, height, negative space) to present a dish in a way that is still visually appealing and professional, despite the non-traditional "canvas." The student then explains how they adapted their presentation to fit the new parameters

- Provide a recipe for a standard dish, like a brownie, and then give the student a hypothetical client with a specific limitation. Ex:
  - Scenario 1: The Client is Blind: The student must focus on creating a multi-sensory experience that does not rely on visual appeal. They could use contrasting textures (e.g., a crunchy top and a soft, chewy interior) and powerful aromas to make the dish appealing.
  - Scenario 2: The Client has Texture Aversions: The student must adapt the recipe to eliminate any undesirable textures. For example, they might turn a fruit pie into a smooth fruit coulis with a meringue topping to avoid a gooey or chewy texture.

STRAND 6

Students will utilize basic culinary math concepts.

Standard 1

Practice proper measuring techniques using appropriate tools.

- Volume and weight are the two standard methods of measuring food. Weight is the most accurate.
  - Volume measuring tools include teaspoons, tablespoons, cups, pints, quarts, gallons, and various sizes of ladles and scoops.
- Weight measuring tools include balance/baker scale and digital scale.

Standard 2

Identify measurement equivalents and apply by adjusting recipe yield.

- Identify measurement equivalents used in food preparation including, but not limited to:
  - 3 t. = 1 T.
  - 16 T. = 1 c.
  - 2 c. = 1 pt.
  - 4 qt. = 1 gal.
  - 8 fl. oz. = 1 c.
  - 4 c. = 1 qt.
  - 1 lb. butter = 2 c.
  - 16 oz. = 1 lb

Standard 3

Define a standardized recipe and identify the components of a standardized recipe.

- Standardized recipe: A recipe that produces the same results and yield every time when the exact procedures are followed.
  - Components of a recipe.
    - Title: name of the recipe
    - Yield: how many servings the recipe will make.
    - List of ingredients and amounts: listed in the order they appear in the recipe.
    - Step-by-step directions: written in order to be completed.
    - Equipment: all kitchen equipment need to complete the recipe including container size and type.
    - Temperature and time: cooking temperature and times to complete the recipe.
- Identify the importance/benefits of standardized recipes to a food service operation.
  - Customer Satisfaction
  - Consistent nutrient content
  - Food cost control

Standard 4

Correctly convert recipe yields.

- Formula for recipe conversion
  - Divide the new yield by the old yield to get the conversion factor:
    - New Yield ÷ Old Yield = Conversion factor
  - Multiply every recipe ingredient by the conversion factor to get the new quantity needed for the new yield:
    - Old ingredient quantity x Conversion factor = New quantity

Standard 5

Examine the difference between Amount Purchased (AP) and Edible Portion(EP) and discuss their importance in the culinary industry. Define AP and EP.

- As Purchased (AP) is the product before any trimming, cutting, or cooking.
- Edible Portion (EP) is the product after it has to be trimmed or cut.

Performance Skills

Create a recipe using all of the components of a standardized recipe.

STRAND 7

Students will demonstrate the production of various stocks, soups and sauces.

Standard 1

Identify the four main types of stocks (white, brown, fish, vegetable) and the components to make a stock.

- To develop flavor, each needs to simmer for a minimum amount of time (do not boil).
  - White Stock: Bones of beef or veal or poultry bones with vegetables, seasonings, and herbs(Sachet d'epices) simmered for 6-8 hours up to 24 hours.
  - Brown Stock: roast the bones for best color and flavor; with roasted vegetables including a tomato paste and carrots, seasonings, and herbs (Sachet d'epices) simmered for 6-8 hours up to 48 hours.
  - Fish Stock: Bones of lean fish with a white mirepoix and herbs (Sachet d'epices) simmered 30-45 minutes.
  - Vegetable Stock: Non-starch vegetables with high flavor profiles sweated for 10 minutes (not browned) simmered and herbs (Sachet d'epices) 45-60minutes.
- Mirepoix is a mix of coarsely chopped vegetables (onion, carrots, celery)
- Bouquet Garni is a combination of aromatic ingredients enclosed in a leek leaf with butcher's twine.
- Sachet d'epices is a combination of aromatic ingredients enclosed in cheesecloth with butcher's twine

Standard 2

Compare soup types, including their ingredients and preparation methods.

- Clear soup (broth, consommé, clear vegetable and noodle soups)
- Thick (creamed, pureed, bisque, chowder)
- Unusual/Regional (gazpacho, gumbo, borscht)

Standard 3

Identify potential thickeners for soups.

- Roux: Equal parts fat and flour heated into a paste.
- Slurry: Cornstarch and liquid
- Starchy foods: ex. Potatoes and pasta
- Beurre manie: Equal parts flour and butter kneaded to make a paste.

Standard 4

Review and practice the production of the five mother sauces in various dishes. (Culinary 1)

- Béchamel
  - Used in some cream soups; also in moussaka, lasagna, soufflé, croquettes, on a Croque Mon- sieur and with vegetable and pastas
  - Derivative Sauce: Mornay/cheese sauce, crème sauce, and soubise
- Velouté
  - With fish or chicken, depending on the stock used; creamed soups
  - Derivative Sauce: Allemande, supreme, poulette
- Espagnole
  - Serve with roasted beef or veal dishes
  - Derivative Sauce: Bourguignonne, demi-glace, chasseur, and bordelaise
- Tomate
  - Serve with pasta, fish, vegetables, poultry, ground meats and sausages.
  - Derivative Sauce: Marinara, creole sauce
- Hollandaise
  - Use with eggs, vegetables, light poultry, fish and beef dishes
  - Derivative Sauce: Béarnaise, Dijon, Chantilly

Performance Skills

Students will make a mother sauces or a derivative to be incorporated with a complementary food item.

STRAND 8

Students will demonstrate an understanding of salads, appetizers, and sandwiches.

Standard 1

Students will define and apply Garde mange

- Garde mange is cold dishes including salad, appetizers, hors d'oeuvres, and canapes.

Standard 2

Students will recognize the terminology and preparation methods of salads and dressings.

- Basic types/uses of salads:
  - Appetizer: Small portion served prior to main dish.
  - Accompaniment: Served with and compliments the main dish
  - Main dish: This should have a variety of nutrients.
  - Separate-course/intermezzo: A light salad served after the main course to refresh the palate.
- Salad greens
  - Choose your green based on season, salad structure, and flavor.
  - Select greens that are fresh and undamaged.
  - Ensure that greens have been thoroughly washed and dried.
  - Remove woody stems and cores.
- Salad dressings
  - Types:
    - Vinaigrette is made with oil and vinegar,
      - In a classically made vinaigrette the ratio will be 3 parts oil to 1 part vinegar.
      - An emulsified vinaigrette keeps the ingredients from separating.
        - Egg yolk and/or mustard are common emulsifiers.
    - A thick dressing is made by using mayonnaise and/or dairy products.
  - Match the type of dressing with salad ingredients.
  - Dress greens just before serving.
  - Starchy salads, such as pasta, potato and rice, should be dressed and refrigerated to allow the flavors to blend and develop.

Standard 3

Identify and compose appetizers and hors d'oeuvres.

- Appetizers are served as the first course of a meal used to stimulate the appetite.
- Hors d'oeuvres are small bites served prior to a meal or at a separate event. Typically a finger food.
- Examples:
  - Brochettes: (Kabob) Food presented on a skewer
  - Filled Pastry Shells: Puff pastry or pastry shell with filling
  - Meatballs: Made from a variety of meat with a variety of sauces
  - Crudités: Raw vegetable tray
  - Canapes: Bread, toast or cracker topped with a savory spread and/or topping
  - Bruschetta: Toasted bread topped with herbs, olive oil, and tomatoes

Standard 4

Recognize and apply the components and different types of sandwiches.

- Three components of a sandwich
  - Base: Bread product or leafy vegetable for the sandwich.
    - Examples: loaf bread, rolls, iceberg lettuce leaves, and flatbreads.
  - Spread: The three main purposes are to prevent bread from soaking up the filling, add moisture, and/or add flavor.
    - Examples: Butter, mayonnaise, vegetable puree, and mustards.
  - Filling: the main component of the sandwich.
    - Examples: meats, fish and shellfish, poultry, cheeses, eggs, vegetables, and fruits
- Types of sandwiches.
  - Closed: Filling is enclosed in the bread product, such as a traditional sandwich, calzone, multi-decker, and wrap
  - Open: Filling is placed on top of the bread product
- Sandwich preparation
  - Hot Sandwiches:
    - Hot Opened Faced Sandwich: Hot filling covered with a hot topping such as gravy or cheese.
    - Grilled Sandwich: Cooked on a griddle.
    - Panini: Cooked in a press
    - Fried Sandwich: Cooked by Submerging in hot oil, resulting in a crispy golden exterior
      - Example: Monte Cristo
    - Pizza: Crust with a variety of toppings.
  - Cold Sandwiches:
    - Sub: A sandwich made from a long, cylindrical bread roll split lengthwise and filled with various ingredients.
      - Example: hero, hoagie, grinder, po boy
    - Wrap: Can be made with a variety of flatbreads or leafy greens, filled and rolled.
    - Canape: a small, decorative, open-faced appetizer, typically consisting of a small piece of bread (or toast, puff pastry, cracker, etc.) as a base, topped with a flavorful spread or filling, and often garnished

Performance Skills

Students will prepare and plate a salad, appetizer, or sandwich.

Durable Skills

Collaboration: Practice collaboration through one of the following activities.

- Divide the class into teams and provide each team with the ingredients and tools to make a dozen identical submarine sandwiches. Each student is assigned a specific role on an assembly line (e.g., one person handles the bread, another the spread, a third the protein, and so on). The team must communicate clearly and work at a consistent pace to produce high-quality sandwiches quickly and without error.
- Conduct a timed relay race that requires a group to work together to produce a salad course. It emphasizes quick and precise collaboration.
  - Process: The group is given all the necessary ingredients and equipment. The first student must wash and dry the greens. The second student then prepares and emulsifies the vinaigrette. The third student is responsible for assembling and dressing the salads, ensuring a pleasing presentation. Each student can only begin their task once the previous student is finished.

STRAND 9

Students will explore the career opportunities needed in the food service and hospitality industry.

Standard 1

Differentiate between the front (service) and back (production) of the house.

- Front of the house service: refers to all the areas and staff within a restaurant, hotel, or hospitality establishment that directly interact with customers.
- Back of the house service: refers to all the operational areas and staff within a restaurant, hotel, or other hospitality establishment that do not directly interact with customers.

Standard 2

Identify front-of-the-house or service jobs and duties

- Host/hostess: greets and seats customers and takes reservations
- Server: meets customer needs
- Bus person: clears and resets table covers and assists the server
- Cashier: responsible for processing payment
- Dining room manager or maître d'hôtel: oversees all service of food and resolves problems
- Sales/inventory representative: Staff responsible for ordering, receiving, and storing supplies.

Standard 3

Identify back-of-the-house or production jobs and duties

- Executive chef: The head of the kitchen. This is the highest-ranking culinary professional who manages all kitchen operations.
- Sous chef: The second-in-command in the kitchen, directly reporting to the Executive Chef.
- Station/line cooks: Cooks responsible for a specific section or "station" of the kitchen and the dishes prepared there.
- Examples: pastry, garde mange, and grill
- Dishwasher: A vital support role responsible for washing and sanitizing all dishes, glassware, utensils, and often pots and pans.

Standard 4

Identify management duties.

- Effective communication
- Active engagement: the culinary industry is a constantly busy and active profession. "if you have time to lean you have time to clean."
- Time Management: production schedules need to be kept for dishes to be completed and timely service for customers
- Resource management
  - Effective managing ingredients and equipment to minimize waste.
  - Employee selection
  - Employee training
    - Orientation – learning about policies and procedures
    - Cross training – learning others jobs so you can cover for them
    - On-the-job training – learning while you work
  - Employee supervision and evaluation
    - Goal Setting
- Collaboration
- Motivation

Standard 5

Investigate the various steps necessary to gain employment.

- Identify various ways to find employment
- Explore various tools used to apply for and obtain a job
  - Job Applications
  - Job Portfolio
  - Resume
  - Letter of request or cover letter
  - Job Interview
    - Thank you - follow-up

Performance Skills

Students will research a specific hospitality or food service career creating a presentation of their findings. A resume/cover letter specific to that career must be included. Teachers might use STAR Event Career Investigation as a resource.

STRAND 10

Students will practice customer service and dining room management.

Standard 1

Discuss the importance of customer service

- Customer service is critical to an establishment's success.
  - Increases customer satisfaction, loyalty, and employee morale
- Understand a variety of types of guest needs
  - Age, families with children, first-timers, special occasions, dietary needs, language barriers, and/or dining alone.

Standard 2

Categorize the main types of dining environments and service styles.

- Environment
  - Quick Service
    - Fast food. Limited menu, low prices, and fast service
  - Fast Casual
    - An upscale quick service.
  - Casual Dining
    - Includes family-style, neighborhood establishments, buffets, and themed restaurants.
  - Fine dining
    - Expensive, great locations, fine food
- Service Styles
  - American Service: Plated in the kitchen, and served directly to the customer
  - French Service: Tableside preparation, food is prepared in the kitchen and finished tableside. Requires skilled servers.
  - Russian Service: Food is prepared in the kitchen and placed on platters. Servers serve food off the tray to the guest's plate.
  - English Service: is referred to as family style. Food is prepared in the kitchen and served in bowls or platters. Guests serve themselves from the bowls or platters.
  - Cafeteria/Counter Service: food is selected and served at the counter.
  - Buffet Service: food is displayed at a table where guests serve themselves.

Standard 3

Analyze the order of food and beverage service.

- Greet Customers
- Seating guests and presenting menus
- Take drink orders
- Take food orders
- Serve appetizers
- Serve main course
- Table Maintenance
- Clearing plates
- Offer dessert and/or coffee
- Present check/process payment

Standard 4

Identify the various pieces of dining equipment and use of each.

- Dining and Service Equipment
  - Dining Equipment – flatware, glassware, dinnerware
  - Service equipment—serving spoon, tongs, tureen, pitcher, platter
- Table setting
  - Center of the table: centerpiece, salt and pepper, condiment holders
  - Napkin in the center of the place setting or to the left
  - Forks on the left, knives and spoons on the right
  - All knife blades turn into the plate
  - Flatware 1” from the edge of the table
  - Dessert forks and spoons at the top of the place setting
  - Bread plate on the left, butter knife on top of the bread plate, blade facing down toward the plate
  - Glassware above the knife
  - Coffee cups to the right of the knives and spoons

STRAND 11

Students will explore and participate in bakery food production.

Standard 1

- Identify the functions and types of each ingredient used in bakery products.
- Flour
  - Flour provides structure.
  - Types
    - Bread, all-purpose, pastry, whole wheat
    - Non-wheat (usually made to be gluten-free). These come from other starchy plants, such as corn, oats, potatoes, beans, and rice.
  - Sugar
    - Sugar provides flavor, color, food for yeast, tenderizer, and a stabilizer for egg whites.
    - Types
      - Syrups: honey, molasses, corn, maple
      - Sugars: brown, turbinado/raw, course/sanding, granulated, super fine/bakers/caster, confectioners/powdered
      - Fruit puree and juice
- Fats
  - Fats provide tenderness, flavor, moisture, browning, and flakiness.
    - Types
      - Shortening—made from vegetable oil that is hydrogenated.
      - Oil
      - Butter—it can be purchased salted or unsalted.
      - Margarine—made from hydrogenated vegetable oil with color, flavor, and water added.
- Leavening
  - Leavening agents are what make baked goods rise and have a light tender texture and good volume.
  - Types:
    - Yeast
    - Chemical
      - Baking soda/sodium bicarbonate: needs an acid to make a chemical reaction that produces carbon dioxide.
      - Baking powder: made of baking soda, a dry acid such as cream of tartar, and a moisture absorber such as corn starch. When mixed with a liquid the ingredients combine to produce carbon dioxide.
    - Physical
      - Eggs—air is introduced by creaming or whisking and is trapped in the protein then it expands when it gets hot.
      - Steam—during baking water evaporates and expands.
- Salt:
  - Adds flavor to food and brings out the flavor of the other ingredients.
- Eggs
  - Functions
    - Structure—contributes to the structure.
    - Emulsification—blends ingredients.
    - Leavening
    - Flavor—when used in large amounts, such as in pate' choux and challah bread.
    - Color

- Liquids
  - Functions
    - form the gluten structure
    - activate leavening agents
    - some give flavor, tenderize, add moisture, and help with browning
  - Types
    - Water
    - Milk and cream
    - Eggs
    - Syrups
    - Fruits and juices
    - Butter, oil, and margarine
- Flavorings
  - Effects taste and color of the final baked product.
  - Types
    - Extracts—liquid flavorings
    - Spices—bark, roots, flower buds, berries or seeds of aromatic plants.
    - Nuts
  - Chocolate
    - Comes from cacao beans harvested from the pod, roasted, chopped into nibs, crushed into a paste called chocolate liquor, and possibly sweetened and flavored (called bittersweet chocolate), or pressed to separate into liquid called cocoa butter and solids that are ground into cocoa powder.
    - Types
      - Unsweetened—a mixture of chocolate liquor and cocoa butter
      - Semisweet—a mixture of chocolate liquor, cocoa butter and sugar
      - Milk chocolate—chocolate liquor, cocoa butter, sugar, sweetened condensed or liquid milk.
      - White—sweetened cocoa butter
      - Cocoa powder—ground solids
      - Dutch-processed cocoa powder—treated with alkali to reduce acidity

Standard 2

Identify the types and mixing methods of various bakery products, including cookies and quick breads.

- Cookies
  - Types:
    - Crisp—very little moisture and a high ration of sugar. Spread more than other cookies.
    - Soft—low amount of fat and sugar, high ratio of liquid such as eggs, corn syrup, molasses or honey is often used.
    - Chewy—high ration of eggs, sugar and liquid, but a low amount of fat. Use pastry flour for an ideal chewy cookie, and develop the gluten during mixing.
  - Most cookies are made using the creaming method of mixing.
  - Shaping/baking methods
    - Drop—chocolate chip and oatmeal
    - Rolled—sugar and gingerbread
    - Molded and pressed—spritz, almond crescents and lace
    - Icebox/refrigerator—the dough is made ahead of time and stored in the refrigerator, then sliced and baked as needed
    - Sheet or pan—brownies and lemon bars

    - Bar cookies—biscotti and fruit bars (like fig newtons)
  - Discuss the proper storage of cookies.
    - Cool completely before storing
    - Keep in an airtight package
    - Can be frozen for up to three months
- Quick breads
  - Identify the types of quick breads:
    - Pour batter (1 part flour to 1 part liquid)—crepes and pancakes
    - Drop batter (2 parts flour to 1 part liquid)—muffins and banana bread
    - Cut in dough (3 parts flour to 1 part liquid)—biscuits and scones.
  - Identify the proper mixing methods of quick breads.
    - Biscuit method—cut the fat into the dry ingredients, then add the liquids.
    - Blending/muffin method—combines liquids, including fat and eggs, in one container and dry ingredients in a separate container and then combine the two mixtures.
    - Creaming method—cream solid fat and sugar until light and fluffy, add eggs one at a time, then add dry and liquid ingredients.
  - Discuss the proper storage of quick breads.
    - Most are best when served fresh. When storing, put in airtight packaging. Use within a few days or freeze for up to three months.

Performance Skills

Plan, calculate cost, prepare and present a cookie or quick bread item for a minimum of 30 people.

Performance Skills

Strand 1
Students will complete a sanitation and food safety training equivalent to or higher than that of the food handler's permit or certificate.

Strand 2
Using the brigade system create a time plan for a mock/real catering opportunity that allows all food to be completed at the correct time of service.

Strand 3
Demonstrate competency with all the knife cuts listed in Strand 1 Standard 4.

Strand 5
Students will explore flavor profiles using herbs and spices and produce a food item using those herbs and spices and an appropriate cooking method.

Strand 6
Create a recipe using all of the components of a standardized recipe.

Strand 7
Students will make a mother sauces or a derivative to be incorporated with a complementary food item.

Strand 8
Students will prepare and plate a salad, appetizer, or sandwich.

Strand 9
Students will research a specific hospitality or food service career creating a presentation of their findings. A resume/cover letter specific to that career must be included. Teachers might use STAR Event Career Investigation as a resource.

Strand 11
Plan, calculate cost, prepare and present a cookie or quick bread item for a minimum of 30 people.

Durable Skills

Strand 1
Communication: Practice communication through one of the following activities.

- Instruct the students will prepare and deliver a short training session to their peers on a specific food safety topic. This could involve demonstrating proper handwashing techniques, explaining dish washing system for a three-compartment sink, or showing how to store food in a refrigerator to prevent raw juices from contaminating ready-to-eat foods.
- Intentionally set up a few minor, non-dangerous safety violations in the lab. For example, a chair might be blocking an exit, a knife left in a sink of soapy water, or a fire extinguisher is not easily accessible. The student's job is to conduct an audit using a provided checklist (or by creating their own) to find these hazards and have students write down each hazard and explain why it is a risk.
- The student is assigned a specific piece of equipment or an area, such as the dishwasher or a specific workstation. They must research the correct sanitation procedure and then write a clear, step-by-step standard operating procedure (SOP) brochure for that piece of equipment.

Strand 2
Leadership: Practice leadership through one of the following activities.

- Using the brigade system have the students in each cooking lab group create a time plan for a mock/ real catering opportunity that allows all food to be completed at the correct time of service.
- Put students each in a leadership position focused on giving the food lab group instruct in different areas including;
  - One student acts as a Quality Control Manager, responsible for ensuring the final product meets professional standards.
  - A student acts as a Mise En Place Coordinator, a leadership role focused on efficiency and organization. The student is tasked with ensuring all the ingredients and equipment are prepped for an upcoming cooking lab.
  - A student takes on the role of an Executive Chef, leading a kitchen brigade to prepare a multi-component meal.

Strand 4
Innovation: Practice innovation through one of the following activities.

- Challenge students to innovate by applying knowledge of different restaurant segments and trends to create a brand-new dining concept
- Instruct students to innovate by applying a historical chef's philosophy to a modern food trend. Ex: The student selects an influential chef from history (e.g., Auguste Escoffier and the kitchen brigade system) and a current food trend (e.g., food delivery services). The student must propose a solution for how a chef's traditional methods could be adapted to meet the demands of the modern trend.
- Focus on innovation within a non-commercial food service segment by challenging students to use data and trends to improve an institutional catering service. EX: The student is given a scenario, such as a school cafeteria's catering service for a teachers' meeting. The student must analyze the current service and identify areas for improvement based on culinary apps and social media trends. The student's task is to redesign the catering menu and service model to be more modern and appealing.

Strand 5

Adaptability: Practice adaptability through one of the following activities.

- Challenge students by providing a recipe for a common dish (e.g., roasted chicken with vegetables) and a set of instructions. Then, just before the cooking begins, introduce a complication: an essential ingredient is missing, a piece of equipment is broken, or the recipe needs to be converted to a different cooking method. The student must decide how to adapt the recipe while maintaining the desired flavor and texture. For example, if the oven is unavailable, the student must convert the roasting technique (dry heat) to a braising or pan-frying technique (combination/dry).
- Instead of the standard plates, provide an unusual serving vessel (e.g., a small cup, a wide, shallow bowl, or a small slate board). The student must use their knowledge of plating elements (color, texture, height, negative space) to present a dish in a way that is still visually appealing and professional, despite the non-traditional "canvas." The student then explains how they adapted their presentation to fit the new parameters
- Provide a recipe for a standard dish, like a brownie, and then give the student a hypothetical client with a specific limitation. Ex:
    - Scenario 1: The Client is Blind: The student must focus on creating a multi-sensory experience that does not rely on visual appeal. They could use contrasting textures (e.g., a crunchy top and a soft, chewy interior) and powerful aromas to make the dish appealing.
    - Scenario 2: The Client has Texture Aversions: The student must adapt the recipe to eliminate any undesirable textures. For example, they might turn a fruit pie into a smooth fruit coulis with a meringue topping to avoid a gooey or chewy texture.

Strand 8

Collaboration: Practice collaboration through one of the following activities.

- Divide the class into teams and provide each team with the ingredients and tools to make a dozen identical submarine sandwiches. Each student is assigned a specific role on an assembly line (e.g., one person handles the bread, another the spread, a third the protein, and so on). The team must communicate clearly and work at a consistent pace to produce high-quality sandwiches quickly and without error.
- Conduct a timed relay race that requires a group to work together to produce a salad course. It emphasizes quick and precise collaboration.
    - Process: The group is given all the necessary ingredients and equipment. The first student must wash and dry the greens. The second student then prepares and emulsifies the vinaigrette. The third student is responsible for assembling and dressing the salads, ensuring a pleasing presentation. Each student can only begin their task once the previous student is finished.

Culinary 2 Vocabulary List

Safety Data Sheet: A document that provides detailed information about a hazardous chemicals

HACCP System: To ensure keeping food safe through a system of identifying and monitoring critical control points

Flow of Food: It begins when you buy the food and ends when you serve it. The purpose of the flow of food is to identify critical control points (CCPs) where food can either experience cross-contamination or time/ temperature abuse

CCPs: Points where food can either experience cross-contamination or time/temperature abuse

Cross-contamination: The unintentional transfer of pathogens from people, surfaces, or food to another. First-in, First-out(FIFO): A rule in food storage and inventory management where the food that has been received or prepared first is used first, ensuring freshness and reducing waste.

Foodborne Illness: A disease transmitted to people by food.

Pathogens: Harmful micro-organisms. They include certain viruses, parasites, fungi and bacteria.

Parasites: Organisms that must live in or on a host to survive.

Ready to Eat (RTE) Foods: Foods that can be eaten without further preparation.

Temperature Danger Zone: The temperature range of 41-135°F. The critical danger zone is 70-125°F, in this range bacterial growth doubles every 20 minutes.

Kitchen Brigade System: A hierarchical system of organization used in professional kitchens, particularly in larger restaurants and hotels.

Mise en Place: A French culinary term meaning "everything in its place." It refers to the organized preparation of ingredients and tools before cooking begins

Maillard Reaction: A chemical reaction between amino acids and reducing sugars that gives browned food its distinctive flavor and aroma

Batonnet: A knife cut of 1/4 x 1/4 x 2-3 inch.

Julienne: A knife cut of 1/8 x 1/8 x 1-2 inch.

Brunoise: A knife cut of 1/8 x 1/8 x 1/8 inch.

Chiffonade: A knife cut where you stack leaves, roll, and slice into thin shreds.

Rondelle: Also called coin cut.

Mince: To cut or chop into very small pieces similar to a paste

Mandolin: A kitchen tool used for slicing and cutting food

Chinois: A cone-shaped sieve with a very fine mesh, used for straining sauces, purees, soups, and other liquids to achieve a smooth, lump-free consistency.

Ricer: A kitchen utensil used to force cooked food (like potatoes or other soft vegetables) through a sieve or small holes, producing a fine, rice-like consistency.

Springform Pan: A type of baking pan with sides that can be removed from the base, typically used for cheesecakes, tortes, and other delicate desserts.

Dutch Oven: A heavy, thick-walled cooking pot with a tight-fitting lid, often made of cast iron, used for long, slow cooking methods like braising, stewing, or baking.

Wok: A versatile, round-bottomed cooking pot, originating from China, used for stir-frying, deep-frying, and steaming.

Convection Oven: An oven that has a fan and exhaust system to circulate hot air evenly around the food.

Conventional Oven: A standard oven that cooks food using radiant heat from heating elements, typically located at the top and/or bottom, without forced air circulation.

Proofer: A warm, humid cabinet used in baking to encourage fermentation of dough by yeast, allowing it to rise before baking.

Steam Table: A piece of kitchen equipment used to keep food hot and at safe serving temperatures, often found in buffets or catering lines.

Hotel Pan: Standard-sized rectangular containers, typically made of stainless steel, used for cooking, holding, and serving food in commercial kitchens and catering operations.

Chafing Dish: A metal dish with a heat source (often a Sterno can) underneath, used to keep food warm at a buffet or catered event.

Speed Rack: A tall, wheeled shelving unit with rails designed to hold sheet pans or hotel pans, commonly used for cooling, storing, or transporting food in commercial kitchens.

Quick Service: A casual dining restaurant; customer pays before eating; fast service, no table service, food can be taken out or to go, low price and a limited menu.

Family Dining: Servers place all the components of a meal on the table, and everyone serves themselves, menu emphasizes families, the customer pays after eating.

Fast Casual Dining: A restaurant that combines the elements of fast food and casual dining; higher quality ingredients, flexible ordering, customization, moderately priced and the customer pays before eating

Casual full-service dining: A restaurant where the majority of menu items are made to order moderately prices, laid-back atmosphere, and table service is included.

Fine Dining: A restaurant that has an elevated menu, table-side cooking, upscale atmosphere, and attentive service, often has a dress code with formal or semi-formal attire, and high-end ingredients.

Catering: Providing food and drink at a social event or other gathering typically as a professional service.

Dry Cooking: Applies heat directly such as with a flame or indirectly by surrounding food with heated air or fat.

Moist Heat Cooking: Applies heat to food by submerging it directly in hot liquid or steam.

Combination Cooking: Uses both dry and moist cooking methods

Standardized recipe: A recipe that produces the same results and yield every time when the exact procedures are followed.

Yield: How many servings the recipe will make.

Mirepoix: A mix of coarsely chopped vegetables (onion, carrots, celery).

Bouquet Garni: A combination of aromatic ingredients enclosed in a leek leaf with butcher's twine

Sachet d'epices: A combination of aromatic ingredients enclosed in cheesecloth with butcher's twine.

Roux: Equal parts fat and flour heated into a paste.

Slurry: Cornstarch and liquid.

Beurre Manie: Equal parts flour and butter kneaded to make a paste.

Bechamel: One of the five classic mother sauces, made by thickening milk with a white roux (equal parts butter and flour cooked together)

Veloute: One of the five classic mother sauces, made by thickening a white stock (chicken, fish, or veal) with a roux.

Espagnole: One of the five classic mother sauces, also known as brown sauce. It's a rich, dark sauce made from a brown roux, brown stock, and mirepoix (onions, carrots, celery), often with tomato paste.

Hollandaise: One of the five classic mother sauces, an emulsified sauce made from egg yolks, clarified butter, and an acid (like lemon juice or vinegar), typically served warm.

Garde Mange: Cold dishes including salad, appetizers, hors d' oeuvres, and canapes.

Front of the house: Refers to service jobs in a restaurant.

Back of the house: Refers to production jobs in a restaurant

Leavening: Leavening agents are what make baked goods rise and have a light tender texture and good volume.

Emulsification: The process of combining two liquids that don't normally mix (like oil and water) into a stable mixture, often with the help of an emulsifying agent (e.g., egg yolk in mayonnaise, or mustard in vinaigrette).

Quick Bread: A type of bread that is leavened primarily with chemical leavening agents (like baking powder or baking soda) rather than yeast, allowing it to be prepared and baked quickly without fermentation time.

STRANDS AND STANDARDS
CULINARY 3

Learning that works for Utah
CTE®

Course Description

This course will train students for career opportunities in the food service/culinary arts industry. Safety and sanitation procedures will be implemented and practiced, as well as knowledge of use and care of commercial food service equipment. Quantity food preparation will be explored as it relates to catering, bakery, restaurant, hospitality, and quick service business operations.

Intended Grade Level	11-12
Units of Credit	1.0
Core Code	34.01.00.00.174
Concurrent Enrollment Core Code	N/A
Prerequisite	Culinary 1, Culinary 2
Skill Certification Test Number	347
Skill Certification Cut Score	**74%**
Test Weight	1.0
License Area of Concentration	CTE &/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Family Consumer Sciences (CTE/General)
Endorsement 2	Culinary Arts

Updated: August 2025

STRAND 1

Connect workplace safety, food safety, and sanitation as applied to food production.

(Review Culinary 2 Strand 1)

Performance Skills

Create a HACCP plan for a potential food item that is going to be sold to the public.

STRAND 2

Differentiate knives and food service equipment function, proper use, and care.

Standard 1

Review types of knives, understand their proper use and care, and demonstrate proper knife safety. (Culinary 1 Strand 3 Standard 1)

- Types of knives including chef, boning, paring, and serrated.
- Practice correct holding technique, sharpening, washing and storing.

Standard 2

Review and demonstrate different knife cuts, including: (Culinary 1 Strand 3 Standard 2)

- Batonnet—1/4 x 1/4 x 2-3 inch
- Julienne—1/8 x 1/8 x 1-2 inch, fine julienne- 1/16 x 1/16 x 1-2 inch
- Brunoise—1/8 x 1/8 x 1/8 inch
- Dice, small—1/4 x 1/4 x 1/4 inch; medium—1/2 x 1/2 x 1/2 inch; large—3/4 x 3/4 x 3/4 inch
- Chiffonade—stack leaves, roll, and slice into thin shreds
- Diagonal—cut on a 45-degree angle
- Rondelle—also called coin cut
- Mince - to cut or chop into very small pieces.
- Oblique – used for long round foods (ex: carrots) of different thicknesses, should have two angled sides.

Standard 3

Identify common small ware food preparation tools, and how it is to be safely used and cleaned. (i.e. mandolin, piping tools, portion scoops, Parisienne scoop(melon baller), chinois, scales, ricer, rolling pins, stem and digital thermometers)

Standard 4

Identify common food preparation cookware and how it is used and cleaned (i.e. roasting pan, springform pan, dutch oven, cast iron pans/skillets, carbon steel, stainless steel, nonstick pan and wok).
To check if the stainless-steel pan is ready to use you can perform a mercury ball test.

Standard 5

Identify common kitchen equipment and how it is to be safely used and cleaned (e.g., convection oven, conventional oven, commercial dishwasher/sanitizer, ice machine, commercial stand mixer, deep fat fryer, proofer, steam table, flat top griddle(plancha)).

Standard 6

Identify common service ware and how it is to be safely used and cleaned. (i.e. hotel pans, sheet pans, chafing dishes, speed rack).

- Hotel pans based on their depth and width determines on how much product they contain.
- Sheet pans come in several sizes; the most used are: full sheet pan(industrial oven size), ½ sheet pan(cookie sheet), ¼ sheet pan.

Performance Skills

Demonstrate competency with all the knife cuts listed in Strand 2 Standard 2 and describe the process of how to sharpen a knife properly.

STRAND 3

Students will apply math concepts pertaining to controlling food costs, portion control, As Purchased(AP)/ Edible Portion(EP), and menu costing.

Standard 1

Identify factors in controlling food costs.

- Monitor product through the flow of food to prevent loss.
- Employee training regarding food theft and waste.
- Examine how forecasting sales drives profitability and growth.

Standard 2

Determine how portion control affects food costs.

- Portion cost
  - Total cost ÷ by the number of portions = cost per portion.
  - Serving tools and/or scales are used to control portion size.

Standard 3

Identify concepts of purchasing food to control expenses.

- Purchasing prepared and processed food items increases product costs.
- Purchasing whole ingredients increases labor costs.
  - As Purchased (AP) is the product before any trimming, cutting, or cooking.
  - Edible Portion (EP) is the product after it has to be trimmed or cut.
  - Percent Yield is percentage of the remaining food after cutting, trimming, or cooking.
    - Edible Portion (EP) ÷ As Purchased (AP) = Percentage Yield
    - Edible Portion (EP) ÷ Percentage Yield = As Purchased (AP)
    - As Purchased (AP) × Percentage Yield = Edible Portion (EP)

Standard 4

Calculate menu pricing.

- Food Cost Percentage: the percentage of sales an operation spends on food products.
  - The two main functions of menu pricing are:
    - Inform customers of cost.
    - Determine profitability of menu item.
  - If your food cost percentage is 30% of the menu price, the additional 70% covers profit and expenses such as labor, rent, utilities, equipment, and insurance.
  - Industry standard food cost percentage ranges 30-40%.
    - Cost Per Portion ÷ Food Cost Percentage = Menu Price
    - Cost Per Portion ÷ Menu Price = Food Cost Percentage
  - Menu item classification
    - A method to determine popularity and profitability of each menu item.
      - Star—high profit, high popularity
      - Plow Horse—low profit, high popularity
      - Dog—low profit, low popularity
      - Puzzle—high profit, low popularity

Performance Skills

Students will determine a menu price for an individual menu item using the principles of menu costing.

Durable Skills

Innovation: Practice innovation through one of the following activities.

- Challenge students to find a way to turn kitchen waste into a marketable product, addressing the durable skill of reducing loss and increasing profitability. The student is given a list of common kitchen scraps from a specific recipe (e.g., vegetable trimmings, chicken bones, fruit peels). Their task is to innovate a new product or a secondary use for these scraps that can be sold or used to enhance a menu item.
- Give students a sample menu with an itemized list of costs and sales data for each dish. The data will show which items are “Dogs” (low profit, low popularity) and “Puzzles” (high profit, low popularity). The student must propose a new menu design that uses innovation to transform these unprofitable items. For a “Dog” item, they might suggest a new marketing strategy or an ingredient substitution to lower costs without compromising quality. For a “Puzzle” item, they could propose a new plating or a special promotion to increase its popularity.
- Give the students a scenario where a restaurant is losing money on a popular dish due to inconsistent portioning. The student’s task is to come up with a solution beyond simply using a scoop or scale. For example, they might design a color-coded system for different portion sizes, a new visual guide for employees to follow, or a new standardized prep method that naturally controls portions. They will create a brief training manual to accompany their new system.

STRAND 4

Students will demonstrate menu planning principles.

Standard 1

Evaluate nutrition principles and specialized dietary plans.

- Dietary Guidelines for Americans programs as per the USDA.
  - Nutritional considerations: Carbohydrates, Protein, Fats, Vitamins, Minerals, Water
  - The acceptable macronutrient distribution range(AMDR) for carbohydrate, protein, and lipids for adults.
    - Carbohydrate: 45-65 percent of daily calories
    - Protein: 10 to 35 percent daily calories
    - Lipid: 20 to 35 percent daily calories
- Special Dietary Needs
  - Food allergies produce histamine when a particular food is eaten.
    - Common food allergens: eggs, milk, tree nuts, peanuts, soy, wheat, sesame, fish and shellfish
    - Substitutes should be made for these allergies and offered to a customer.
  - Intolerances are the body's inability to process or breakdown foods.
    - Common food intolerances: celiac, lactose
- Modification may be needed for low sodium, low fat, vegan, etc.
- Menu development for any diet modifications should be considered and offered as a part of a comprehensive menu.

Standard 2

Define types of menus and their importance in the style of a restaurant.

- Types of menus
  - Static/Fixed: Still or unchanging
  - Cycle: Non-commercial segment
  - Market: Food available in the market
  - Take-out: Foods that will be consumed off premises
  - Room service: Food ordered to an individual hotel room, not a duplication of the restaurant menu, can order breakfast the night before.
  - Noncommercial: education, hospital, prison, and retirement community.
  - Banquet or Special occasion: a sequence of courses with little or no guest choice
  - Catering: company supplies food, drink, and experience tailored to the client's needs
  - Brunch: includes breakfast and lunch items served through lunch, usually on weekends
  - Tasting: Chef determines the course selection and sequence, portions very small with 5 to over 25 courses
  - Children's: Essential to attracting families with kids includes entrée, beverages and desserts. Small portions, low sales price and includes foods that are simple and mild.
  - Dessert: Separate from main menu, encourages sales

Standard 3

Describe the menu pricing options below:

- Table d' hote a multi course meal; fixed menu with entrée flexibility. ex: Banquet
- Prix Fixe—a set complete meal at one price ex: buffet
- A la Carte—All items priced and ordered separately.
- Semi A la Carte -blends features of both a la carte and tasting menu, offers a limited number of dishes, often with a focus on seasonal ingredients and create flavor combinations
- California—All items offered all day

- Menu design and construction:
  - Basic menu layout and organization
  - Food descriptions and photos
  - Themes, colors and fonts
  - Pricing psychology – using odd cent, pricing by the ounce.

Performance Skills

Create a full-service menu costing one item on the menu; based on one of the menu types.

STRAND 5

Students will explore marketing and identify the applications of marketing strategies.

Standard 1

Explore marketing in the culinary industry.

- Marketing: the process of attracting and influencing potential customers.
  - Factors to consider when determining marketing strategies include location, population, and demographics
  - Marketing strategies:
    - Public relations—sponsorships, charity events
    - Sales Promotions –cost incentives like a 2 for 1, rewards or loyalty programs, samples
    - Advertising-- websites, television, radio; usually cost is involved
    - Direct Marketing—email, digital media, mailers
    - Personal Selling—training employees on how to sell the menu, influencers
    - Social Media Presence – Branding, marketing management plan, engagement, visibility, online activity, posts, and interactions
      - SWOT Analysis – Used to determine a restaurant's/business's feasibility
      - S- Strengths
      - W- Weaknesses
      - O – Opportunities
      - T- Threats

Performance Skills

Use one marketing strategy to promote your culinary program, or mock culinary event.

Durable Skills

Communication: Practice communication through one of the following activities.

- Students could practice effective communication by promoting a culinary program or mock culinary event using a selected marketing strategy.
- The student is given a hypothetical restaurant (e.g., a new local pizza place) and a target audience (e.g., local college students). The student's task is to develop and present a one-week social media marketing plan. This should include a SWOT analysis, a clear brand message, and a series of posts for different platforms (e.g., an Instagram story to offer a discount code and a TikTok video to show a behind-the-scenes look at the kitchen).
- The student could research and follow the standard format of a press release. It could include a clear headline, a compelling lead paragraph that answers the five W's (who, what, where, when, why), and a boilerplate with a short description of the company. The student must use a formal, objective tone to share news and information with the public.

STRAND 6

Students will integrate knowledge and skills as applied to preparation of eggs, milk and milk products.

Standard 1

Discuss the selection and preparation of eggs.

- Grade or quality, this decreases with age.
  - Grades: AA, A, B
  - As eggs age the albumen loses its strength (protein structure breaks down), becoming watery and harder to whip.
- Size (is determined by weight per dozen)
  - Largest to smallest; Jumbo, Extra Large, Large, Medium, Small and Peewee.
  - Standard recipes use large eggs (approx. 2 oz. per egg).
- Purchase form
  - fresh- sold in shell, or pooled (in a container or bag)
  - frozen- high quality fresh, whole eggs that are pasteurized and frozen.
  - dried- used mostly for baked goods and commercial use
- Color- Shell color is determined by the breed of chicken that lays it. It is not an indicator of taste or nutrition.
  - Eggs can be prepared many ways.
    - Fried/sautéed- over medium heat
      - Sunny-side up: yolk is unbroken, egg is not flipped during cooking, the white is firm, yolk is runny
      - Basted: a type of sunny side up in which the white is cooked by spooning hot butter over the egg while frying, or adding a little water to the pan/grill and covering the egg to steam it.
      - Over-easy, over-medium, over-hard: egg is turned over while cooking, named by yolk consistency.
      - Scrambled: made with whole or egg whites, cooked over low/medium heat while gently stirring.
      - Omelets—whisked eggs prior to cooking and can be filled with vegetables, cheese and/or meats
      - Frittata: open faced omelets of Spanish origin, the hearty fillings are mixed directly into the eggs, cooked on the stove and transferred to oven or broiler to finish cooking through, cut into wedges for serving.
      - Poached: best to use very fresh eggs that will hold their shape, eggs are removed from the shell and cooked in gently simmering water, white should be firm and yolks runny
      - Simmered in shell, to the desired doneness, cool quickly to avoid discoloration.
        - Soft: simmered 4-6 minutes
        - Hard: simmered for 12-15 minutes
    - Baked
      - Shirred: prepared in individual ramekins. The whites should be set while the yolks are soft and creamy.
      - Quiche: an egg custard and fillings baked in a crust

Standard 2

Define and discuss milk and milk products.

- Processing prior to purchase
  - Pasteurization: the process of heating milk to destroy pathogens.
  - Homogenization: the process in which the fat particles in milk are reduced in size and dispersed throughout the liquid
- Milk is labeled and sold by fat content: skim, 1%, 2% and whole (4%)
- Non-dairy substitutes could be: almond milk, coconut milk, oat milk, and soy milk etc…
- Cream is also labeled and sold by fat content
  - Half and half= 10-18% fat
  - Light cream= 18-30% fat
  - Regular whipping cream= 30-36% fat
  - Heavy cream: has at least 36% fat
- Cultured dairy is made by adding specific bacterial cultures to fluid dairy products. The bacteria convert the milk sugar to lactic acid. The acid slows growth of undesirable microorganisms. The lactic acid gives these product tang, body and unique flavors.
  - Buttermilk, sour cream, creme fraiche, and yogurt
    - Butter is produced by agitating cream. Regular composition is 80% fat, 16% water, 2-4% solids (protein, lactose etc.)
  - Sweet: no salt added
  - Salted: 1.7% the addition of salt increases the amount of time it can be stored and enhances flavor
  - Clarified: water and solids removed, to increase the smoking point
  - Non-dairy substitutes could be: coconut oil butter, margarine, and olive oil butter etc.
- Cheese
  - Fresh/unripened: cream cheese, marscarpone, mozzarella, queso oaxaca, ricotta
  - Soft: brie, boursin, camembert, taleggio
  - Semi-soft: cabrales, fontina, gorgonzola, gouda, havarti, jack, provolone
  - Firm: cheddar, Emmenthaler, gruyere, jarlsberg, manchego
  - Hard: asiago, parmesan, romano
  - Processed cheese: American, cheese spread, canned cheese
  - Non-dairy substitutes usually made from coconut, nuts, and nutritional yeast.

Performance Skills

Students will prepare a dish that includes eggs, milk, or milk products

STRAND 7

Students will identify characteristics of produce including fruits, vegetables and garnishes while applying preparation principles.

Standard 1

Identify characteristics of produce (fruits and vegetables)and the appropriate selection, storage and preparation methods.

- Selecting quality produce.
  - Produce can be purchased fresh, canned, frozen, dried, or preserved
  - Fresh produce in season will be generally of a higher quality and lower cost.
- Proper storage of produce.
  - The temperature for storing produce varies.
    - To finish ripening produce, store at room temperature.
    - Produce that is already ripe should be chilled to slow ripening.
  - Starchy vegetables such as potatoes, winter squash and vegetables in the onion family, are best stored at 60-70°F. in a dry location.
  - In food service plan to keep fresh produce in inventory no longer than a week.
- Enzymatic browning is the process of food turning brown from exposure to oxygen and/or cell damage.
  - Foods prone to enzymatic browning include apples, potatoes, bananas, avocadoes, peaches, and pears.
  - A variety of methods can be used to prevent it.
    - Submerged in water.
    - Lemon juice and other acids that lower the pH.
    - Blanching or other forms of cooking denature the enzymes.
    - Lower temperatures can slow the speed of reactions.
  - Discuss various cooking techniques and their effect on nutrient preservation/loss.
    - Dry heat tends to preserve nutrients and flavors
      - Dry heat cooking methods include: grilling/broiling, roasting/baking, deep frying, sautéing/stir frying
    - Moist heat can result in significant nutrient loss.
      - To help prevent nutrient loss, cook for a minimum amount of time and use as little water as possible.
      - Moist heat cooking methods include: blanching/par boiling, steaming, simmering, braising, boiling

Performance Skills

Students will prepare and present a food item containing produce.

Durable Skills

Adaptability: Practice adaptability through one of the following activities.

- Practice adaptability by analyzing the characteristics of various ingredients (e.g., eggs, milk, produce, grains, meats, seafood, fruits and vegetables) and selecting appropriate preparation methods and storage techniques based on desired outcomes and product characteristics.
- Test a student's ability to adapt when they can't get the ideal fresh produce. Give the student a recipe that calls for specific fresh, in-season produce (e.g., fresh berries for a dessert). Then, give the student a "procurement problem" scenario, such as:
  - Scenario: The fresh produce is unavailable or too expensive. The student must select a different form of the produce (canned, frozen, or dried) and adapt the recipe to use it effectively. For example, if fresh berries aren't available, they must use frozen berries and adjust the cooking time and sugar content to account for the added moisture.
- Give the students an ingredient prone to enzymatic browning, like an apple or potato. Deliberately expose it to oxygen, so it begins to brown. The student's task is to "rescue" the produce by using a method to stop the browning (e.g., a lemon juice and water bath, or a quick blanch). They must also explain the scientific reason for their chosen method.

STRAND 8

Students will identify the characteristics of grains, pasta, potatoes and legumes and appropriate cooking methods.

Standard 1

Identify the characteristics of, and cooking methods for grains.

- Characteristics
  - Long grain rice—stays light and fluffy after cooking, commonly used in pilaf.
  - Medium grain rice—moist, tender, slightly chewy grains, commonly used in risotto and paella.
  - Short-grain rice—sticky, commonly used in sushi.
  - Brown rice—the whole grain form of any length of rice.
  - Instant rice—precooked and dehydrated, cooks rapidly.
  - Converted rice—partially cooked with steam and fortified when dried.
  - Quinoa—high in protein and has all of the essential amino acids.
  - Barley, farro and spelt—types of wheat, commonly used in soups and salads.
  - Oats—can be rolled, cut, or used whole, commonly used as a cereal.
  - Corn—considered a grain when dried, it can be ground fine, medium or coarse used in polenta or grits.
- Storage
  - Store dry grains in a cool dry place.
  - After cooking, grains are a TCS food.
- Cooking techniques
  - Cooking methods
    - Boil: boiled in unmeasured amount of water, when cooked excess water is drained.
    - Steam: added to a measured amount of liquid, covered and cooked. This can take place in the oven, microwave or stove top.
    - Pilaf: sautéed, then a measured amount of liquid is addedAl
    - Risotto: cooked while stirring in warm liquid a little at a time.

Standard 2

Identify the ingredients, types and cooking methods for pasta.

- Ingredients
  - Flour—most common is durum (semolina)wheat.
  - Liquid—water, eggs and oil
  - Other ingredients are often added to change texture, color, and flavor.
- Types and uses
  - The name of the pasta is determined by the shape.
  - The shape of the pasta determines what sauce to use.
- Cooking pasta
  - Pasta is usually added to boiling, salted water and cooked until al dente.

Standard 3

Identify the types and cooking methods for potatoes.

- Types: rich in nutrients, such as carboydrates, vitamins, and minerals.
  - Low starch: Red, fingerling, or new potatoes
  - High Starch: Russet, sweet potatoes, or Yukon gold potatoes
  - Waxy: purple/blue, red, yellow or new potatoes
  - All-purpose: Russet, white or Yukon gold potatoes
  - Cooking techniques—potatoes are very versatile they may be cooked using almost any dry or moist heat method.
  - Different types of potatoes produce a better outcome for certain dishes.
- Receiving, storage and handling
  - Store potatoes in a cool, dry, dark, well-ventilated place – not the refrigerator.
  - Before use, scrub and rinse well.
  - After cutting potatoes, if you are not cooking them right away, cover with water to prevent browning.

Standard 4

Identify the types and storage of legumes.

- Types of legumes—Beans, Lentils, Peanuts, Peas, Soybeans
- Storage
  - Store dry legumes in a cool dry place.
  - After cooking, legumes are a TCS food.
- High in protein, dietary fiber, and other essential nutrients.
- Legumes are very versatile; used in soups, salads, or veggie burgers etc..

Performance Skills

Students will prepare a product containing one of the following: grains, pasta, potatoes or legumes.

Durable Skills

Leadership: Practice leadership through one of the following activities.

- Cultivate leadership by building successful culinary teams; to create a dish that contains grains, pasta, potatoes or legumes and understanding employee expectations within a culinary setting.
- Task the students with creating a new recipe that incorporates at least two of the four food groups in this strand(grains, pasta, potatoes, or legumes) and a specific cooking method. For example, they might create a quinoa salad with roasted sweet potatoes and a lentil dressing. After developing the recipe, the student will create a clear, step-by-step instructional guide for their classmates. Then, they will lead a brief training session to teach others how to make the dish, answering questions and providing tips.

STRAND 9

Students will identify sustainable practices in food service.

Standard 1

Describe sustainable food practices.

- Explore how local sourcing can support local businesses and increase operational efficiency and quality.
  - utilizing seasonal menus: Prioritizing ingredients grown or produced locally and in season reduces transportation emissions, supports local economies, and often ensures fresher, higher-quality produce.
  - personal production: restaurants grow their own food
  - shopping locally: partnering with local farmers, small scale farms, and local food co-ops , supporting community initiatives
  - Food waste reduction: through inventory management, zero-waste cooking, food donation, portion control, preservation, waste management by: recycling appropriate food scraps to local farms(compost or feed), and proper food storage.
- Explore sustainable practices in food production.
  - organic: Sourcing organic ingredients avoids harmful pesticides and chemicals, while supporting regenerative agriculture practices improves soil health, sequesters carbon, and enhances biodiversity
  - protecting marine resources: Choosing seafood certified by organizations like the Marine Stewardship Council (MSC) or Aquaculture Stewardship Council (ASC) ensures that fish populations and marine ecosystems are not overexploited.
  - extending shelf life: food preservation through freeze drying, dehydrating, vacuum sealing, canning, fermentation, dairy processing(cheese & butter)

Standard 2

Investigate methods of resource management.

- Water Conservation—energy star appliances, maintain and repair immediately, low flow toilets and faucet aerators
- Energy Conservation—lighting, programmable thermostats, energy star rated appliances
- Supplies and Building Materials
  - Supplies—paper products, reusable vs. disposable
  - Building—LEED certified (leadership in energy and environmental design)

Standard 3

Analyze waste management applications.

- Reduce—Monitoring purchasing, menu adjustments, portion size, packaging
- Reuse—repurposing food, food donations
- Recycle—environmental food packaging, biofuels, composting

Durable Skills

Professionalism: Practice professionalism through one of the following activities.

- Students will analyze a local restaurant, foodservice operation or within the school to determine if local sourcing would increase operational efficiency and quality for that business.
- Select a multi-ingredient recipe (e.g., a dish with multiple vegetable scraps). Their task is to develop a zero-waste menu plan that utilizes all parts of the ingredients. They must outline a plan for each part of the food item, from the primary ingredient to the scraps. For instance, if they're making roasted cauliflower, they might propose using the stems for a vegetable stock and the leaves for a garnish or a separate roasted side dish. The student must document the projected cost savings.
- Give the students a checklist to audit the classroom kitchen's current resource management. This includes checking for leaky faucets, ensuring lights are off when not in use, and assessing the use of reusable versus disposable supplies. The student must document their findings and create a professional report that identifies areas for improvement. The report should include specific, actionable recommendations

STRAND 10

Students will recognize various types of poultry, meat, and seafood and apply appropriate cooking techniques.

Standard 1

Explain types, purchasing, preparation, and storage of poultry.

- Types—poultry include turkey, chicken, duck, goose, pheasant, quail, and other birds
  - Identify the white meat vs. dark meat characteristics
    - White Meat: located on the breast & wings of the bird; lower in fat but less flavorful, easy to overcook.
    - Dark Meat: Located on the legs and thighs of the bird; more connective tissue, which requires longer cooking times and allows for higher internal cooking temperatures without drying out the meat. Dark meat has more calories but is more flavorful.
  - Purchasing—mandatory inspection and voluntary grading
  - Storage—41 degrees or lower on the lowest shelf in the refrigerator
  - Preparation—dry or moist heat cooking methods
    - Cooking temperatures: All poultry (whole or ground) must be cooked to a minimum temperature of 165°F.
    - Fabrication: the process of cutting or breaking down the poultry into its usable parts.

Standard 2

Explain types, purchasing, preparation, and storage of meats.

- Types—beef, pork, veal, and lamb.
- Purchasing—mandatory inspection and voluntary grading
- Storage—41 degrees or lower, below ready-to-eat foods and above raw poultry.
- Preparation
  - Fabrication
    - Wholesale cuts
      - More tender from support muscles
      - Less tender from movement muscles
    - Retail cuts—examples include roast, steak, chops, stew meat and ground meat.
  - Tenderizing methods:
    - Mechanical: grinding, needling, pounding, cutting thin
    - Chemical: marinating and meat tenderizers
    - Cooking: slow and dry (i.e., smoking), slow and moist (i.e., stewing, braising, cooking in a slow cooker)
  - Cooking methods
    - Dry heat is commonly used with tender cuts.
    - Moist and combination heat is commonly used with less tender cuts.
  - Cooking temperatures
    - Beef, veal, pork and lamb roasts, steaks and chops: minimum internal temperature is 145°F.
      - Rare: Internal temperature 125-130F; item has been seared on both sides, offers no resistance when pressed, meat is red in color, warmed through
      - Medium Rare: Internal temperature 135F- 140F; item has moisture beads on top as it is being cooked, then flipped to the opposite side to finish the cooking process, meat is bright pink in color, when pressed meat should have an indentation.
      - Medium: Internal temperature 140F - 145F; similar cooking process to medium rare with a longer cooking time; meat is slightly pink

        - Well Done: Internal temperature 145 F -160 F; meat is brown with no trace of pink, firm to the touch.
    - All ground red meats including pork: minimum internal temperature of 155°F.

Standard 3

Explain types, purchasing, preparation, and storage of seafood.

- Types
    - Fin fish—Round fish (two filets: trout, snapper, salmon, cod), flat fish (four filets: halibut, flounder, dover sole)
    - Shellfish—Crustaceans (lobster, crab, shrimp), Mollusks (clam, scallops, oyster), Cephalopods (octopus, squid, cuttlefish)
- Purchasing—slight sea smell, eyes clear and full, gills bright red, flesh firm, shells closed, no slime
- Storage—41 degrees or lower, below ready-to-eat foods and above raw meat and poultry.
- Preparation
    - Fabrication for fin fish
        - Drawn, dressed, pan-dressed, filet, steaks
    - Cooking methods depend on the size of portion and type of fish.
    - Cooking temperatures: fin fish are recommended to cook at 145°F. Shellfish easily overcooked Raw fish – Must be sushi or sashimi grade fish that has been processed at appropriate temperatures(frozen) to kill off parasites.

Performance Skills

Students will prepare meat, poultry or seafood using an appropriate cooking method

STRAND 11

Students will be able to explore various outdoor cooking equipment and determine appropriate outdoor cooking techniques.

Standard 1

Identify and describe various outdoor cooking appliances, including smokers, dutch ovens, grills, griddles, pizza ovens, and campfire cooking.

- Smokers
  - Types of Smokers
    - Offset Smokers: Firebox attached to the side; indirect heat and smoke cook the meat in the main chamber.
    - Vertical/Water Smokers: Food cooks above a water pan; maintains moisture and steady heat.
    - Pellet Smokers: Use compressed wood pellets and electronic controls for consistent temperature and smoke.
    - Electric Smokers: Use electric heating elements and wood chips for smoke; easy to maintain temperature.
    - Kamado Grills: Ceramic cookers (e.g., Big Green Egg) that retain heat and moisture exceptionally well.
    - Gas Smokers: Use propane for heat and wood chips for smoke.
  - Cooking Methods & Developing Flavor
    - Indirect low heat is used as smoke compounds are absorbed by raw meat. Thin blue smoke is ideal for flavor; thick white smoke can make food bitter.
    - Flavor Differences: Each smoker type and fuel source provides unique flavors, moisture levels, and textures. Each type of wood imparts a different flavor profile.
    - Temperature Control: Different smokers offer varying levels of temperature stability and ease of control.
    - Smoke Ring Formation: Nitrogen dioxide from smoke reacts with myoglobin in raw meat, creating a pink ring beneath the surface.
- Dutch Oven Cooking
  - Heavy cast iron pot with tight-fitting lid
  - Used for baking, roasting, stewing, frying, and braising outdoors
  - Can be used directly over campfire coals, buried in coals, or with charcoal briquettes placed strategically on the lid and beneath.
  - Maintains steady, radiant heat for slow, even cooking
- Grilling (Direct Heat)
  - Cooks food quickly over high heat
  - Common for burgers, steaks, vegetables, and smaller proteins.
- Griddling (Outdoor flattop griddles)
  - Similar to an indoor griddle
  - Cooks a large amount of food quickly.
  - Common for burgers, steaks, pancakes, pizza, tortillas, ideal for large quantities of food, very versatile.
- Pizza Ovens
  - Ovens designed to cook at high temperatures typically have stone or steel bases and are surrounded on most sides to keep heat in.
  - Can be wood-fired, gas-fired, coal-fired, or electric.
  - Can also be used to cook other foods that do well at high temperatures.

- Campfire Cooking
  - Using grates, skewers, or foil packs over open flames or coals
  - Requires fire management and understanding of heat zones

Standard 2

Students will be able to determine the appropriate outdoor cooking equipment necessary for each type of cooking implement and discuss how to care for each.

- Identify essential barbecue tools and equipment such as long-handled tongs, grill brush, basting brush, spatula heat heat-resistant gloves, thermometers (oven/grill safe & digital meat thermometers), butcher paper, injectors & fire extinguisher.
  - Different types of outdoor cooking may require other equipment.
- Demonstrate proper cleaning and maintenance of smokers and related equipment.
- Compare care requirements for barbecue equipment versus standard kitchen equipment.

Standard 3

Students will be able to select appropriate cuts of meat for various outdoor cooking processes and explain choices based on desired outcomes.

- Select appropriate cuts of meat for smoking and explain choices based on desired outcomes.
- Compare and contrast marinating, brining, dry and wet rubs techniques and their effects on flavor, moisture retention, and texture.
  - Marinating: The process of soaking food, typically meat in a flavorful liquid before cooking.
  - Brining: Soaking food in a highly concentrated salt solution (brine) before cooking.
  - Dry Rub: The application of a blend of spices, herbs, and salt is applied directly to the surface of the food before cooking.
  - Wet Rub: A paste or sauce-like mixture of spices and herbs with a liquid base that is applied to meat before cooking.

STRAND 12

Students will explore and participate in bakery food production.

Standard 1

- Identify the functions and types of each ingredient used in bakery products.
- Flour
  - Flour provides structure.
  - Types
    - Bread, all-purpose, pastry, whole wheat
    - Non-wheat (usually made to be gluten-free). These come from other starchy plants, such as corn, oats, potatoes, beans, and rice.
- Sugar
  - Sugar provides flavor, color, food for yeast, tenderizer, and a stabilizer for egg whites.
  - Types
    - Syrups: honey, molasses, corn, maple
    - Sugars: brown, turbinado/raw, course/sanding, granulated, super fine/bakers/caster, con-confectioners/powdered
    - Fruit puree and juice
- Fats
  - Fats provide tenderness, flavor, moisture, browning, and flakiness.
  - Types
    - Shortening—made from vegetable oil that is hydrogenated.
    - Oil
    - Butter—it can be purchased salted or unsalted.
    - Margarine—made from hydrogenated vegetable oil with color, flavor and water added.
- Leavening
  - Leavening agents are what make baked goods rise and have a light tender texture and good volume.
  - Types:
    - Yeast
    - Chemical
      - Baking soda/sodium bicarbonate: needs an acid to make a chemical reaction that pro- duces carbon dioxide.
      - Baking powder: made of baking soda, a dry acid such as cream of tartar, and a moisture absorber such as corn starch. When mixed with a liquid the ingredients combine to produce carbon dioxide.
    - Physical
      - Eggs—air is introduced by creaming or whisking and is trapped in the protein then it expands when it gets hot.
      - Steam—during baking water evaporates and expands.
- Salt:
  - Adds flavor to food and brings out the flavor of the other ingredients.
- Eggs
  - Functions
  - Structure—contributes to the structure.
  - Emulsification—blends ingredients.
  - Leavening
  - Flavor—when used in large amounts, such as in pate' choux and challah bread.
  - Color

- Packaging types
  - Shell eggs—sold in flats that hold 30 eggs. If stored properly at 41°F or below, they will last up to four weeks beyond the packing date.
  - Egg products—eggs that have been removed from the shell and pasteurized.
- Liquids
  - Functions
    - form the gluten structure
    - activate leavening agents
    - some give flavor, tenderize, add moisture, and help with browning
  - Types
    - Water
    - Milk and cream
    - Eggs
    - Syrups
    - Fruits and juices
    - Butter, oil, and margarine
- Flavorings
  - Effects taste and color of the final baked product.
  - Types
    - Extracts—liquid flavorings
    - Spices—bark, roots, flower buds, berries or seeds of aromatic plants.
    - Nuts
- Chocolate
  - Comes from cacao beans harvested from the pod, roasted, chopped into nibs, crushed into a paste called chocolate liquor, and possibly sweetened and flavored (called bittersweet choco- late), or pressed to separate into liquid called cocoa butter and solids that are ground into cocoa powder.
- Types
  - Unsweetened—a mixture of chocolate liquor and cocoa butter
  - Semisweet—a mixture of chocolate liquor, cocoa butter and sugar
  - Milk chocolate—chocolate liquor, cocoa butter, sugar and powdered, sweetened condensed or liquid milk.
  - White—sweetened cocoa butter
  - Cocoa powder—ground solids
    - Dutch-processed cocoa powder—treated with alkali to reduce acidity

Standard 2

Identify the types, preparation, and storage methods of yeast breads.

- Types:
  - Lean—very little or no sugar or fat—dry, chewy crumb and hard crust.
  - Rich—addition of shortening, butter, sugars, eggs, milk or cream—moist, with a soft structure and fine crumb
- Preparation methods
  - Straight-dough—mix all the ingredients together in one step.
  - Modified straight dough—yeast is activated before adding remaining ingredients.
  - Sponge method—First sponge (water, yeast, and flour) is made and allowed to ferment. Second, final ingredients are added.
  - Rolled in dough—dough that has layers of fat folded and rolled in, resulting in a rich, flakey texture.

- Packaging and storing
  - Cool completely before packaging.
  - Best if used within one day in a food service operation.
  - If keeping for more than one day, wrap tightly, and freeze to prevent from going stale.

Standard 3

Identify the types, preparation, and storage methods of pies and pastries.

- Types of pie & pastry doughs and fillings:
  - Basic pie dough, 3-2-1 dough, referring to the ratio of flour to fat and water.
  - Crumb crust made from crackers or cookies.
  - Pate Choux—light pastry dough containing fat, liquid, flour, and eggs.
  - Puff Pastry—light pastry made from laminated dough.
  - Cream—sweet pastry cream filling. Examples are coconut, banana and chocolate silk.
  - Custard—made with eggs that set when baked. Examples are pumpkin and pecan.
  - Chiffon—an airy filling stabilized with gelatin. Beaten egg whites or whipped cream are folded in.
  - Fruit- sweet mixture of fruit, often combined with sugar, thickeners (like flour, cornstarch, or tapioca), and sometimes spices, cooked or prepared to be baked inside a pie crust.
  - Savory- cooked mixture of ingredients, often including meats, vegetables, sauces, or cheeses, prepared to be enclosed and baked within a pie crust
- Preparation
  - Do not overmix or over-handle pie dough, it will result in a tough texture.
  - Shells that are baked empty before filling are known as baking blind.
- Storage
  - Baked fruit pies can be held at room temperature 1-2 days. Do not freeze.
  - Unbaked fruit pies or empty shells can be frozen for up to 2 months
  - Cream pies need to be refrigerated and used with 2-3 days. Do not freeze.
  - Pate choux shells can be baked, cooled, and frozen.

Standard 4

Identify the preparation and storage methods of cakes and types and functions of icings.

- Preparation methods for cakes
  - Creaming—Cream fat, sugar and salt, add the eggs and other liquids; add the sifted dry ingredients.
  - Sponge—Fold in the dry ingredients into the whipped whole eggs, then fold in the melted cooled butter.
  - Foam—Egg whites, liquid flavorings and part of the sugar are whipped to stiff peaks; remaining sugar and flour are folded in. Cooled upside down.
- Storage of cakes
  - Can be frozen for up to one month.
- Types of frosting/icings
  - Buttercream
  - Fondant
  - Ganache
  - Glaze
- Functions of frosting/icings.
  - Creates a protective coating for baked goods
  - Contributes to flavor and richness
  - Improves appearance

Performance Skills

Students will prepare and present a bakery item for a minimum of 30 people.

Durable Skills

Collaboration: Practice collaboration through one of the following activities.

- Instruct the students to work together in a cooking lab group to use the scientific principles of baking and pastry arts to create a range of complex items, including various doughs, cakes, and frostings.
- Challenge students to work together to solve a baking problem. Provide a recipe with a deliberate, subtle error (e.g., incorrect liquid-to-flour ratio for a pie dough, or an incorrect ratio of baking powder to baking soda).
    - The team attempts to follow the recipe as written. When the baked good fails (e.g., the pie crust is tough, or the cake does not rise), the team must work together to diagnose the problem. They must analyze the function of each ingredient and discuss how the error affected the final product. Then, they will propose and implement a solution. This could also be done without making the incorrect recipe; by giving the students the problem scenario, how it failed, and then creating and/or correcting the recipe.
- Give a group of students(or the class) the task of preparing a variety of baked goods (e.g., a loaf of yeast bread, a slice of cake, and a mini pie). The team's final task is to collaboratively plan and create a visually appealing display that showcases all their creations. They must decide on a color scheme, arrangement, and garnishes. Each student(or cooking group) can be responsible for one item, but they must work together to ensure the final presentation is harmonious and professional.

Performance Skills

Strand 1
Create a HACCP plan for a potential food item that is going to be sold to the public.
Strand 2
Demonstrate how to sharpen a knife.
Strand 3
Students will determine a menu price for an individual menu item using the principles of menu costing.
Strand 4
Create a full-service menu costing one item on the menu; based on one of the menu types.
Strand 5
Use one marketing strategy to promote your culinary program, or mock culinary event.
Strand 6
Students will prepare a dish that includes eggs, milk, or milk products
Strand 7
Students will prepare and present a food item containing produce.
Strand 8
Students will prepare a product containing one of the following: grains, pasta, potatoes or legumes.
Strand 10
Students will prepare meat, poultry or seafood using an appropriate cooking method
Strand 12
Students will prepare and present a bakery item for a minimum of 30 people.

Durable Skills

Strand 3
Innovation: Practice innovation through one of the following activities.

- Challenge students to find a way to turn kitchen waste into a marketable product, addressing the durable skill of reducing loss and increasing profitability. The student is given a list of common kitchen scraps from a specific recipe (e.g., vegetable trimmings, chicken bones, fruit peels). Their task is to innovate a new product or a secondary use for these scraps that can be sold or used to enhance a menu item.
- Give students a sample menu with an itemized list of costs and sales data for each dish. The data will show which items are “Dogs” (low profit, low popularity) and “Puzzles” (high profit, low popularity). The student must propose a new menu design that uses innovation to transform these unprofitable items. For a “Dog” item, they might suggest a new marketing strategy or an ingredient substitution to lower costs without compromising quality. For a “Puzzle” item, they could propose a new plating or a special promotion to increase its popularity.
- Give the students a scenario where a restaurant is losing money on a popular dish due to inconsistent portioning. The student’s task is to come up with a solution beyond simply using a scoop or scale. For example, they might design a color-coded system for different portion sizes, a new visual guide for employees to follow, or a new standardized prep method that naturally controls portions. They will create a brief training manual to accompany their new system.

Strand 5

Communication: Practice communication through one of the following activities.

- Students could practice effective communication by promoting a culinary program or mock culinary event using a selected marketing strategy.
- The student is given a hypothetical restaurant (e.g., a new local pizza place) and a target audience (e.g., local college students). The student's task is to develop and present a one-week social media marketing plan. This should include a SWOT analysis, a clear brand message, and a series of posts for different platforms (e.g., an Instagram story to offer a discount code and a TikTok video to show a behind-the-scenes look at the kitchen).
- The student could research and follow the standard format of a press release. It could include a clear headline, a compelling lead paragraph that answers the five W's (who, what, where, when, why), and a boilerplate with a short description of the company. The student must use a formal, objective tone to share news and information with the public.

Strand 7

Adaptability:

- Practice adaptability by analyzing the characteristics of various ingredients (e.g., eggs, milk, produce, grains, meats, seafood, fruits and vegetables) and selecting appropriate preparation methods and storage techniques based on desired outcomes and product characteristics.
- Test a student's ability to adapt when they can't get the ideal fresh produce. Give the student a recipe that calls for specific fresh, in-season produce (e.g., fresh berries for a dessert). Then, give the student a "procurement problem" scenario, such as:
    - Scenario: The fresh produce is unavailable or too expensive. The student must select a different form of the produce (canned, frozen, or dried) and adapt the recipe to use it effectively. For example, if fresh berries aren't available, they must use frozen berries and adjust the cooking time and sugar content to account for the added moisture.
- Give the students an ingredient prone to enzymatic browning, like an apple or potato. Deliberately expose it to oxygen, so it begins to brown. The student's task is to "rescue" the produce by using a method to stop the browning (e.g., a lemon juice and water bath, or a quick blanch). They must also explain the scientific reason for their chosen method.

Strand 8

Leadership: Practice leadership through one of the following activities.

- Cultivate leadership by building successful culinary teams; to create a dish that contains grains, pasta, potatoes or legumes and understanding employee expectations within a culinary setting.
- Task the students with creating a new recipe that incorporates at least two of the four food groups in this strand (grains, pasta, potatoes, or legumes) and a specific cooking method. For example, they might create a quinoa salad with roasted sweet potatoes and a lentil dressing. After developing the recipe, the student will create a clear, step-by-step instructional guide for their classmates. Then, they will lead a brief training session to teach others how to make the dish, answering questions and providing tips.

Strand 9

Professionalism: Practice professionalism through one of the following activities.

- Students will analyze a local restaurant, foodservice operation or within the school to determine if local sourcing would increase operational efficiency and quality for that business.
- Select a multi-ingredient recipe (e.g., a dish with multiple vegetable scraps). Their task is to develop a zero-waste menu plan that utilizes all parts of the ingredients. They must outline a plan for each part of the food item, from the primary ingredient to the scraps. For instance, if they're making roasted cauliflower, they might propose using the stems for a vegetable stock and the leaves for a garnish or a separate roasted side dish. The student must document the projected cost savings.
- Give the students a checklist to audit the classroom kitchen's current resource management. This includes checking for leaky faucets, ensuring lights are off when not in use, and assessing the use of reusable versus disposable supplies. The student must document their findings and create a professional report that identifies areas for improvement. The report should include specific, actionable recommendations

Strand 12

Collaboration: Practice collaboration through one of the following activities.

- Instruct the students to work together in a cooking lab group to use the scientific principles of baking and pastry arts to create a range of complex items, including various doughs, cakes, and frostings.
- Challenge students to work together to solve a baking problem. Provide a recipe with a deliberate, subtle error (e.g., incorrect liquid-to-flour ratio for a pie dough, or an incorrect ratio of baking powder to baking soda).
    - The team attempts to follow the recipe as written. When the baked good fails (e.g., the pie crust is tough, or the cake does not rise), the team must work together to diagnose the problem. They must analyze the function of each ingredient and discuss how the error affected the final product. Then, they will propose and implement a solution. This could also be done without making the incorrect recipe; by giving the students the problem scenario, how it failed, and then creating and/or correcting the recipe.
- Give a group of students (or the class) the task of preparing a variety of baked goods (e.g., a loaf of yeast bread, a slice of cake, and a mini pie). The team's final task is to collaboratively plan and create a visually appealing display that showcases all their creations. They must decide on a color scheme, arrangement, and garnishes. Each student(or cooking group) can be responsible for one item, but they must work together to ensure the final presentation is harmonious and professional.

Culinary 3 Vocabulary List

HACCP plan: A plan to ensure food safety through a system of identifying and monitoring critical control points.

Chef Knife: A multi-purpose kitchen knife with a broad, tapering blade, typically 6 to 12 inches long, used for chopping, slicing, dicing, and mincing a wide variety of foods.

Boning Knife: A knife with a thin, flexible blade, usually 5 to 6 inches long, designed for separating raw meat from the bone.

Paring Knife: A small, short-bladed knife, typically 2 to 4 inches long, used for intricate tasks like peeling, trimming, and garnishing small fruits and vegetables.

Serrated Knife: A knife with a blade that has a saw-like edge, ideal for slicing foods with a tough exterior and soft interior, such as bread or tomatoes, without crushing them.

Batonnet: A knife cut of 1/4 x 1/4 x 2-3 inch.

Julienne: A knife cut of 1/8 x 1/8 x 1-2 inch.

Fine Julienne: A knife cut 1/16 inch x 1/16 inch x 1 to 2 inches

Brunoise: A knife cut of 1/8 x 1/8 x 1/8 inch.

Dice (Small, Medium, Large): Cube-shaped knife cuts:

- Small Dice: Approximately 1/4 inch x 1/4 inch x 1/4 inch.
- Medium Dice: Approximately 1/2 inch x 1/2 inch x 1/2 inch.
- Large Dice: Approximately 3/4 inch x 3/4 inch x 3/4 inch

Chiffonade: A knife cut where you stack leaves, roll, and slice into thin shreds.

Diagonal: A knife cut made at an angle across a cylindrical or elongated food item (like carrots or celery), resulting in oval or elongated oval shapes with a larger surface area.

Rondelle (Coin Cut): Also called coin cut; vertical cut on any round fruit or vegetable.

Mince: To cut or chop into very small pieces similar to a paste

Oblique: A knife cut used for cylindrical foods, where the food is cut diagonally, then rotated 90 degrees and cut again at the same diagonal angle

Mandolin: A kitchen tool used for slicing and cutting food

Piping tools: A set of tools, typically including pastry bags (reusable or disposable) and various decorative tips (nozzles), used to pipe or squeeze soft food mixtures like frosting, purées, or doughs for decorating, filling, or portioning

Portion scoops: Utensils designed to scoop and measure consistent, uniform portions of food (like cookie dough, mashed potatoes, or meatballs), available in various sizes to control serving amounts

Parisienne scoop (Melon baller): A small, double-ended spoon-like tool with a sharp-edged, hemispherical scoop at each end, used to cut uniform spheres from fruits (like melon) or vegetables

Chinois: A cone-shaped sieve with a very fine mesh, used for straining sauces, purees, soups, and other liquids to achieve a smooth, lump-free consistency.

Scales: Kitchen instruments used to accurately measure the weight of ingredients, essential for precise baking and consistent recipe results.

Ricer: A kitchen utensil used to force cooked food (like potatoes or other soft vegetables) through a sieve or small holes, producing a fine, rice-like consistency.

Rolling pins: A cylindrical utensil, usually made of wood, metal, or marble, used to flatten and evenly roll out dough (for pastries, pies, breads) or other food items

Stem thermometer: A thermometer with a long, thin probe (stem) that is inserted into food to measure its internal temperature, commonly used for roasting meats or checking liquids.

Digital thermometer: An electronic thermometer that provides a quick and precise digital readout of temperature, often used for food to ensure doneness and safety

Roasting pan: A large, rectangular pan with relatively high sides, typically made of sturdy metal, designed for roasting meats, poultry, or vegetables in an oven

Springform Pan: A type of baking pan with sides that can be removed from the base, typically used for cheesecakes, tortes, and other delicate desserts.

Dutch Oven: A heavy, thick-walled cooking pot with a tight-fitting lid, often made of cast iron, used for long, slow cooking methods like braising, stewing, or baking.

Cast iron pans/skillets: Heavy, durable cooking pans made from cast iron, known for their excellent heat retention and even heat distribution

Carbon steel: A material used for cookware, particularly woks and frying pans, that offers a balance between cast iron's heat retention and stainless steel's responsiveness

Stainless steel: A widely used material for cookware, favored for its durability, resistance to corrosion and staining, non-reactivity with foods, and ease of cleaning, often used in multi-ply constructions for better heat distribution.

Nonstick pan: A cooking pan coated with a material (like Teflon or ceramic) that prevents food from sticking to its surface, requiring little to no oil or fat for cooking

Wok: A versatile, round-bottomed cooking pot, originating from China, used for stir-frying, deep-frying, and steaming.

Mercury ball test: A method used to test if a griddle or flat top is evenly heated and properly calibrated. A small amount of water(few drops) is placed on the surface; if it forms a perfect ball and rolls smoothly, the temperature is even.

Convection Oven: An oven that has a fan and exhaust system to circulate hot air evenly around the food.

Conventional Oven: A standard oven that cooks food using radiant heat from heating elements, typically located at the top and/or bottom, without forced air circulation.

Proofer: A warm, humid cabinet used in baking to encourage fermentation of dough by yeast, allowing it to rise before baking.

Steam Table: A piece of kitchen equipment used to keep food hot and at safe serving temperatures, often found in buffets or catering lines.

Flat top griddle (Plancha): A large, flat cooking surface, usually made of steel or cast iron, heated from underneath, used for cooking foods directly on its surface, such as pancakes, eggs, burgers, or fajitas.

Hotel Pan: Standard-sized rectangular containers, typically made of stainless steel, used for cooking, holding, and serving food in commercial kitchens and catering operations.

Sheet pans (Full, ½, ¼): Rectangular, shallow pans with raised edges used for baking, roasting, and general food preparation in ovens. The sizes refer to standard commercial dimensions:

- Full Sheet Pan: Approximately 26 x 18 inches.
- Half (½) Sheet Pan: Approximately 18 x 13 inches.
- Quarter (¼) Sheet Pan: Approximately 13 x 9.5 inches.

Chafing Dish: A metal dish with a heat source (often a Sterno can) underneath, used to keep food warm at a buffet or catered event.

Speed Rack: A tall, wheeled shelving unit with rails designed to hold sheet pans or hotel pans, commonly used for cooling, storing, or transporting food in commercial kitchens.

Star: A method to determine popularity and profitability of each menu item. A Star Item is high profit, high popularity

Plow Horse: A method to determine popularity and profitability of each menu item. A Plow Horse item is low profit, high popularity

Dog: A method to determine popularity and profitability of each menu item. A Dog item is low profit, low popularity.

Puzzle: A method to determine popularity and profitability of each menu item. A Puzzle item is high profit, low popularity.

Acceptable Macronutrient Distribution Range (AMDR): A range of intake for a particular macronutrient (carbohydrates, fats, and proteins) that is associated with reduced risk of chronic disease while providing adequate intake of essential nutrients.

Static/Fixed Menu: A menu where all of the items are still or unchanging.

Cycle Menu: A menu that offers different dishes on a rotating basis over a set period (e.g., a week, month, or season), after which the cycle repeats.

Market Menu: A menu that changes frequently, often daily, to feature ingredients that are fresh, seasonal, and readily available from local markets or suppliers

Take-out Menu: A menu specifically designed for customers to order food that they will pick up from the establishment and consume off-site.

Room service Menu: A menu consisting of only food ordered to an individual hotel room, not a duplication of the restaurant menu, can order breakfast the night before.

Noncommercial (Education, Hospital, Prison, Retirement community) Menu: Specific menu with food options usually on a weekly or monthly rotating basis.

Banquet or Special Occasion Menu: A menu that lists a sequence of courses with little or no guest choice.

Catering Menu: Client chooses food items based on their needs for a specific event; the company supplies food, drink, and experience tailored to the client's previously determined needs.

Brunch Menu: A Menu that includes breakfast and lunch items served through lunch, usually on weekends

Tasting Menu: A Menu that is determined by the chef including the course selection and sequence, portions very small with 5 to over 25 courses.

Children's Menu: Essential to attracting families with kids includes entrée, beverages and desserts. Small portions, low sales price and includes foods that are simple and mild.

Dessert Menu: A menu that includes only dessert items offered to the customer, separate from main menu, encourages sales.

Table d' hote: A menu where a complete meal is offered at a fixed price, with limited choices for each course.

Prix Fixe: Similar to Table d'hôte, this menu offers a multi-course meal at a set total price

A la Carte: A menu style where each food item is individually priced, allowing guests to order dishes separately rather than as a set meal.

Semi A la Carte: A menu where some items (like entrées) are priced individually, but they may include accompaniments (like a side salad or vegetable) in the main price, while other items are priced separately.

California: A menu that lists all available food items throughout the day, without separate sections for breakfast, lunch, or dinner, reflecting the flexibility of dining at any time

Pasteurization: A heat treatment process applied to liquids (like milk) to kill harmful bacteria and extend shelf life, while largely preserving flavor and nutritional value.

Homogenization: A process applied to milk that breaks down fat globules into smaller, uniform sizes, preventing them from separating and rising to the top as a cream layer.

Enzymatic browning: A chemical reaction that occurs in fruits and vegetables (like apples or avocados) when their exposed surfaces react with oxygen in the presence of enzymes, causing them to turn brown.

Lactic acid (in baking): An organic acid produced by lactic acid bacteria, commonly found in sourdough starters or cultured dairy products, contributing to flavor, texture, and leavening in baked goods.

Acetic acid (in baking): An organic acid, typically produced in smaller amounts than lactic acid in sourdough fermentation, which contributes to a sharper, more vinegary tang in baked goods.

STRANDS AND STANDARDS

BAKING & PASTRY

Learning that works for Utah
CTE®

Course Description

This course introduces Culinary Arts students to another aspect of the Culinary Arts industry, baking and pastry. Students will gain experience with baking terminology, equipment, formula conversions, and practice methods for creating yeast breads, pastries, fillings, cakes, and cookie production. Students will also have the opportunity to practice industry workplace skills, food safety and understand the opportunities for careers within the baking and pastry industry.

Intended Grade Level	11-12
Units of Credit	0.5
Core Code	34.01.00.00.176
Concurrent Enrollment Core Code	N/A
Prerequisite	Culinary Arts 1 & 2; Prostart 1 & 2
Skill Certification Test Number	349
Skill Certification Cut Score	**70%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Family and Consumer Sciences
Endorsement 2	Culinary Arts

Updated: August 2025

STRAND 1

Consistently demonstrate workplace safety, food safety, and sanitation techniques.

Standard 1

Review established safety rules and guidelines in a work environment. (Refer to Culinary 1 Strand 1 Standard 1 & 4)

Standard 2

Review health and hygiene requirements & Food-borne illness prevention for food handling. (Refer to Culinary 1 Strand 1 Standard 2)

Durable Skills

Professionalism: Students will demonstrate professionalism and workplace safety through one of the following.

- Students should dress appropriately for the cooking lab, making sure to follow all personal hygiene responsibilities while working with food.
- Independently conduct a comprehensive food safety audit of their workstation and equipment before and after a baking lab; identifying potential safety hazards and food critical control points.
- The student researches and creates a checklist for a cooking lab based on a professional food safety standard like ServSafe or local health department guidelines.

STRAND 2

Explore the baking and pastry industry, education and career opportunities.

Standard 1

Explore the baking and pastry educational & professional opportunities.

Educational

Associate, Bachelor's and Master's degree available in Baking and Pastry

- Depending on desired career outcome.

Professional

American Culinary Federation (ACF)

Retail Bakers of America(RBA)

- Certifications range from novice to master's level, with a variety of specializations

The Bread Bakers Guild of America

Standard 2

Analyze the career opportunities available in the baking and pastry industry.

Entrepreneurship

- Restaurants
- Gourmet Shop
- Cafes
- Specialized confectioners

Corporation

- Wholesale Bakeshops
- Hotels
- Grocery
- Stores
- Commercial

STRAND 3

Apply necessary skills for baking and pastry production.

Standard 1

Employ proper measuring techniques.

Utilize weights and measures by demonstrating proper scaling and measurement.

- Digital scales are the most commonly used scales to weigh ingredients.

Compare and contrast volume and weight measurements.

- Professional bakers use weight measurements which produces a more consistent product.
- Weight measurements are more accurate and consistent than volume measurements.

Apply the baking formulas

- Bakers' Percentage: A formula used to keep products consistent; it allows you to determine exactly how muchdough must be produced to meet specific production needs, while maintaining the correct ratios.
    - In bread baking; flour or a combination of flours is represented by 100%.
    - In other baking items, one ingredient is represented by 100% and the other ingredients are based off of that 100% ingredient; some ingredients may be over 100%.

Examine the difference between standardized recipes and professional recipes.

- Standardized recipes are designed for consistent, repeatable results, ensuring quality, cost control, and efficient operations.
- Professional bakers recipes: represent the initial foundation for standardized recipes, but they also highlight the importance of technique, adaptability, and scalability to achieve specific

Standard 2

Define terms related to baking and pastry methods, processes, and techniques.

Docking: Pricking a pie crust to allow steam to escape while baking.
Blind Baking: baking a pie crust or pastry without the filling.
Tempering: Bringing two liquids together to a similar temperature by combining them completely.
Fold in: incorporating two mixtures together delicately. Mix by cutting down the center of the mixture and sweeping to the side. Repeat until incorporated.
Cut in: Using a solid fat worked into flour until the pieces of fat are very small.
Cream: Using a solid fat beaten together with sugar to form a web of air between the fat and sugar. Lightens and leavens baked goods.
Blooming: soften gelatin in cool liquid before using. Ensures a smooth texture in the final product.
Caramelization: Browning of sugars by heat. Creating a complex flavor.
Leavening: Process of baked goods rising. Three categories are chemical leaveners (baking soda or powder), organic leaveners (yeast), and physical leavener (air).
Gelatinization: Process by which starch granules absorb water and swell in size.
Proof: Final rise of a yeast bread product prior to baking.
Oven Spring: Final burst of rising just after a yeast product is put in the oven before the crust hardens.
Gluten: Protein in wheat, barley, and rye. Found in the endosperm of the grain.
Batter: Semi- liquid mixture containing a flour or other starch that provides structure.
Dough: Thick, malleable, often elastic mixture that is stiff enough to knead or roll.
Streusel: Crumbly topping for baked goods made of flour, fat, sugar, and flavoring(s).

Meringue: Delicate, frothy mixture made with beaten egg whites and sugar.

- Swiss: Sugar and egg heated together, to 160F and then whipped to desired peaks.
- Italian: Made with boiling sugar syrup.
- French: Whisk the egg whites, then adding granulated sugar until the desired peaks are reached. Less stable than Swiss and Italian.

Pasteurized: process of heating a food to a certain temperature for a certain amount of time to reduce or destroy pathogens.

Puree: Cooked food usually fruits or vegetables that have been ground, pressed, or blended to a paste or liquid.

Steep: the process of soaking dry ingredients, like spices, in a hot liquid (usually below boiling point) to extract flavors and soften the ingredients.

Nappe: When a sauce thickens so that it coats the back of a spoon and remains in place when a finger is drawn across the surface.

Standard 3

Review mise en place and professional cookery practices techniques (Culinary 2: Strand 2 Standard 2 & 3)

Practice using a baking timeline.

Bakers use a timeline to stay organized and ensure everything is ready at the right time. Bakers must account for preparation, resting, chilling, baking, and cooling time. It is best to plan backward from the final deadline (pick up time or event) and plan when each task must happen.

Standard 4

Explore the equipment utilized by the baking and pastry industry.

Explore oven types and the benefits of use.

- Convection Oven: A cooking device that heats food by the circulation of hot air.
- Convention Oven: Uses two heating elements, one at the top and one at the bottom, to cook food. It relies on radiant heat to gradually cook food, providing consistent cooking.
- Mixers
  - Countertop Mixers: Typically 5 quart to 8 quarts
  - Hobart Mixers: Typically 20, 40, 60, or 80 Quarts

Explore large production equipment utilized in baking and pastry.

Performance Skills

Students will properly weigh ingredients using a scale, to produce a baked good.

Durable Skills

Adaptability: Students will demonstrate adaptability in baking & pastry production through one of the following.

- Executing a complex baking recipe (e.g., a multi-component pastry or layered cake) within a baking timeline, demonstrating precise scaling, appropriate mixing methods, and accurate oven management. Following the lab, they will complete a self-reflection log, critically analyzing their time management and identifying specific strategies for improvement in future productions.
- Provide a standard baking formula (e.g., a basic cookie recipe) and then present the student with a scenario where a key ingredient is missing or needs to be swapped for a dietary restriction.
- Challenge the students to apply a new baking method to a familiar recipe. The teacher provides a recipe that typically uses one method (e.g., standard creaming method for a cake). The student must then produce the same product using a different method.

STRAND 4

Explore a variety of cookies

Standard 1

Differentiate between the six cookie variety preparation methods.

Drop (chocolate chip, oatmeal)

- Made from dough firm enough to be spooned or scooped onto a baking sheet.

Bar/Sheet (lemon bar, brownie)

- Baked in large sheets and portioned after baking.

Rolled/Cut Out (sugar, gingerbread cookie)

- Dough prepared, chilled and rolled then cut into desired shape before cooking.

Molded (spritz, almond crescent)

- A dough with a stiff batter enough to be formed by hand, stamped, pressed or piped(molded).

Wafer (tuille)

- A dough with a thin batter that is spread with a spatula and stencil or by hand(wafer).

Twice baked (biscotti)

- Prepared in a log or loaf, baked then cooled, sliced and re-baked.

Piped (Macarons)

- Batter is placed in a piping bag and piped into shapes on a sheet pan.

Ice Box (checkerboard, shortbread)

- Dough that is shaped into a log, chilled, then cut into portions, and baked.

Standard 2

Discuss proper holding and storage of cookies.

Cooling: The process of allowing baked goods to release heat and moisture after being removed from the oven, transitioning from a hot, pliable state to a firm, stable consistency.

- Cooling is the absolute first and most crucial step in cookie preservation.
  - Prevents sogginess, aids firmness, affects flavor
- Transfer cookies to a wire rack when the sides have set this allows the air to circulate, and ensure even cooling.
- Allow cool completely before packaging or storing.

Packaging: The process of enclosing a product in a container or wrapping material for protection and preservation.

- Paper: depends on the type of cookie; usually used if selling or eating immediately.
- Plastic: for long term storage, good for freezing and reusable.

Storage: can be stored for up to a week in an airtight container or frozen for up to 2 months

Performance Skills

Students will produce at least two different varieties of cookies

Durable Skills

Innovation: Students will practice innovation through baking a variety of cookies.

- Develop and produce a new cookie variation based on one of the six established preparation methods, experimenting with ingredients or flavor profiles.
- Challenge a student to innovate with flavor combinations by fusing a cookie with an unexpected culinary influence. Instead of adding standard mix-ins like chocolate chips or nuts, the student must incorporate a flavor from a different cuisine or a savory ingredient.
- Systematically manipulate variables to engineer a cookie with a specific desired characteristic. Instead of just following a recipe, the student conducts a small, scientific experiment to produce a cookie that is either chewier, flatter, or puffier than a standard recipe.

STRAND 5

Demonstrate yeast bread preparation skills.

Standard 1

Discuss the types of flours used in baking and pastry.

Review common baking ingredients.

- Gluten is a protein that is formed by two proteins (glutenin and gliadin); when water is added to the mixture and kneaded, gluten is formed.

Compare and contrast the variety of flours and uses for each.

- High Gluten Bread Flour: High protein content from 14% - 16%; adds strength, elasticity, and structure to the bread like bagels, pizza crust, and ciabatta.
- Bread Flour: Lower protein content from 12% - 14%; the standard flour used in yeasted bread making like baguettes, sandwich bread, pretzels.
- All Purpose Flour: Protein content from 9% -11%; creates softer enriched doughs like cinnamon rolls, brioche, and challah.

Standard 2

Discuss the end product of a yeasted bread including the interior and exterior of yeast breads.

- Interior Crumb:
  - Open Crumb: Cross-section consists of large and irregular gaps and air pockets within the interior of the loaf
  - Closed Crumb: Cross-section consists of smaller air pockets which creates a dense and finer texture throughout the loaf
- Exterior Crumb:
  - Yeast breads made from lean dough: Firm crust, crust is golden brown, crispy, often looks rustic, may be scored, may be flaky
  - Yeast breads made from enriched dough: may be shiny, texture of crust is soft, golden brown

Standard 3

Compare types of yeasts used in baking yeast breads.

- Dry Yeast
  - Active yeast - Must be activated in warm liquid before being added to the dough.
  - Instant yeast - Rapid-rise or quick-rise yeast, is a type of dry yeast that can be added directly to dry ingredients without needing to be dissolved in liquid first.
- Cake/Bakers/Compressed Yeast (fresh) - A fresh form of yeast that is typically sold in small, compressed blocks. It's known for its reliability in traditional baking and needs to be refrigerated.
- Preferments - Preferments in yeast breads are portions of the dough that are mixed and fermented separately before being incorporated into the final dough. These are typically made with commercial yeast.
  - They enhance flavor, improve texture, and can affect the bread's rise and shelf life.
  - Common types include poolish, biga, sponge, and pâte fermentée.
- Wild Yeast - Yeast species found naturally in the environment, as opposed to cultivated, commercial yeast strains. These yeasts are often sourced from organic fruits, organic wheat or rye flour, and even the air. They contribute to fermentation processes in foods like sourdough bread.

Standard 4

Discuss how gluten specific diseases affect the making of yeasted breads.
Dietary needs: refers to tailoring the ingredients and methods of bread production to accommodate specific health requirements, sensitivities, allergies, or lifestyle choices of individuals.

- Celiac Disease: Autoimmune disorder where the ingestion of gluten leads to damage in the small intestine.
- Gluten intolerance: non-celiac gluten sensitivity; experience digestive symptoms after ingesting gluten.
- Commercial gluten-free bread flour is available.

Standard 5

Analyze the difference between the types of yeast dough.

Lean Dough

- A dough made primarily from flour, water, salt, and yeast.
- Characteristics - chewy texture, crisp crust, and open crumb structure
- Examples - baguette, ciabatta, artisan loaves

Enriched Dough

- A dough made from flour, water, salt, yeast with the additions of fat, dairy, sugar, and/or eggs
- Characteristics - soft texture, tender crumb, and rich flavor
- Examples – challah(hal-luh), brioche, soft dinner rolls, sweet roll dough, hamburger buns

Standard 6

Examine the mixing methods of yeasted breads.

Straight Mixing Method

- Mix all the ingredients together in one step. As a result, the dough can lack flavor and shelf-life.

Sponge Mixing Method

- Yeast is mixed with a portion of the flour and water then allowed time to develop (sponge) prior to mixing the other ingredients.

Brioche Mixing Method

- Sponge method with butter added as the last ingredient.

Standard 7

Practice the steps of production for yeast breads.

1. Scaling(measuring) ingredients
2. Mixing ingredients
3. Bulk(primary) Fermentation: initial rise
4. Folding or de-gas it: helps create more flavor
5. Dividing: based on type of product; divide into portions
6. Preshaping: create rounds, oblongs, or final shape
7. Bench Rest: relaxing the gluten before finishing shaping
8. Shaping: final product shape
9. Final Fermentation: final rise
10. Scoring (Wash & Slash): based on final bread product; addition of egg wash or water wash.
11. Baking
12. Cooling: sets the structure, aroma, and flavor.

Standard 8

Discuss proper holding and storage of yeast breads.

- Loaves should be completely cool before cutting
- For storage loaves should be wrapped tightly and frozen.
- Loaves may be kept in the freezer for up to 2 months.
- Refrigeration is not ideal for bread storage; it causes the bread to stale and absorbs refrigerator odors.
- Sustainability
  - Usable waste (bread pudding, croutons)

Performance Skills

Students will produce both a lean and an enriched yeast dough.

STRAND 6

Explore and produce a variety of fillings used in baked products.

Standard 1

Demonstrate the production and use of a custard

Stirred Custard/Pudding: a versatile class of culinary preparations, primarily composed of eggs, dairy, and often sugar, thickened through the coagulation of egg proteins by heat. Their texture can range from delicate and pourable to firm and sliceable, depending on the ratio of ingredients and cooking method

- Curd - A rich, tangy stirred custard made with butter, egg yolk, and strong-flavored/acidic fruits, particularly citrus that helps to balance the large quantity of butter.
  - **Key Characteristics**: Velvety smooth, intensely flavored, firm enough to hold its shape but still spreadable.
  - **Examples**: lemon, lime, raspberry, pineapple, or orange curd
  - **Products**: lemon meringue pie, entremet
- Pastry cream (Creme Patisserie)- A thickened stirred custard, made with milk, egg, egg yolk, sugar, cornstarch, butter, and typically vanilla or other flavorings. The addition of the cornstarch necessitates the need to boil the custard; to activate the starch.
  - **Key Characteristics**: Thick, smooth, pipeable, holds its shape well.
  - **Examples**: Coconut, chocolate, vanilla, berry, or pistachio pastry creams
  - **Products**: coconut cream pie, filled doughnuts, boston cream pie, banana pudding, trifle
  - **Variations**: Diplomat cream, Creme legere, Creme mousseline, Creme chiboust
- Creme Anglaise- Meaning “English cream” in French, is a fundamental and versatile stirred custard sauce in classic French pastry, that is not boiled when cooking. It is a light, pourable, sweetened custard that is typically flavored with vanilla.
  - **Key Characteristics**: Smooth, creamy, rich, melts slowly.
  - **Example**s: Ice Cream, dessert sauce accompaniment
- Mousse- Made with a base of a curd, pastry cream or creme anglaise. They are light and airy by incorporating whipped cream and/or whipped egg whites and can be stabilized with gelatin.
  - **Key Characteristics**: Light, airy, intensely flavored, delicate texture.
  - **Examples**: Chocolate, vanilla, orange, almond, or strawberry mousse
  - **Products**: Entremet, chocolate mousse dessert, or mousse cake
- Bavarian Cream- Made with a crème anglaise, fruit puree or combination of the two stabilized with gelatin, lightened with an equal amount of whipped cream. An intense flavor must be used in the base, as the whipped cream will lessen the flavor as it is added.
  - **Key Characteristics**: Smooth, delicate, jiggly, holds its shape when unmolded.
  - **Examples**: Vanilla, Chocolate, walnut, or blackberry
    - Avoid: pineapple or mango (destabilizes gelatin)
  - **Products**: Molded Bavarian cream desserts, Charlottes, Cake filling

Standard 2

Practice making a variety of baked custards.

Baked Custard: Similar to a stirred custard uses eggs, milk or cream, flavorings, and sugar(omitted for savory dishes). Cooked gently in an oven, often in a water bath (bain-marie), to ensure even cooking and prevent cracking or curdling.

- Custard Pie fillings - Custard ingredients added to the unbaked pie shell, often with other ingredients (such as pecans) providing a rich and creamy interior that sets firmly when baked.
  Key Characteristics: Smooth, creamy, sets firm when cooled, often browned on top.
  Products: Pumpkin, pecan, or buttermilk pie
- Bread Pudding: A classic comfort dessert that utilizes stale bread, soaked in a sweet, spiced custard and then baked until golden and firm.
  Key Characteristics: Moist, tender interior with a slightly crisp top, rich and flavorful.
  Examples: Chocolate, vanilla, cinnamon
- Crème Brulèe: A rich, individually baked custard characterized by a crisp, caramelized sugar topping that is traditionally torched just before serving.
  Key Characteristics: Silky smooth, rich, firm custard contrasted with a brittle, sweet, glass-like sugar crust.
  Examples: Vanilla bean, chocolate, or orange
- Creme caramel: A classic baked custard with a soft, smooth texture, that starts with a caramelized sugar on the bottom of the dish which produces a caramel sauce when baked. To serve it is inverted to reveal a layer of thin caramel sauce.
  Key Characteristics: Silky smooth, wobbly, sweet, with a distinct caramel flavor and glistening sauce.
  Examples: Creme caramel dessert, flan, chocoflan
- Soufflè: A light and airy baked dish that uses a base (often a thick béchamel for savory, or a pastry cream/crème anglaise for sweet) folded with stiffly beaten egg whites, which cause it to puff dramatically during baking. Baked in a dish with tall sides. An intense flavor must be used in the base, as the egg whites will lessen the flavor as they are added.
  Key Characteristics: Extremely light, airy, delicate, impressive rise, creamy interior, often served immediately as it deflates quickly.
  Examples: Cheese, chocolate, raspberry, lemon, vanilla
- Quiche: A savory tart with a rich, creamy baked herbed custard filling that includes various ingredients like cheese, cooked meats (bacon, ham), and vegetables. The custard sets firmly during baking.
  Key Characteristics: Flaky pastry crust, savory and creamy custard interior, holds its shape when sliced, versatile with fillings.
  Examples: Quiche Lorraine, summer vegetable, spinach, asparagus
- Cheesecake: A dessert characterized by a rich, dense, and creamy filling, typically made with cream cheese (or other soft cheeses), eggs, sugar, and sometimes sour cream or heavy cream, baked over a crust (often made from graham crackers or cookies) or may be crustless.
  Key Characteristics: Smooth, dense, creamy texture; rich flavor; distinct crust; often chilled for hours after baking to fully set.
  Examples: New York cheesecake, Basque cheesecake, strawberry, chocolate

Standard 3

Demonstrate how to use fruit in a variety of desserts.

Pie Filling: compositions of fruit, sweeteners, thickeners often the natural pectin found in fruits and cornstarch or tapioca, and flavorings designed to be encased within a pastry crust and baked. The fruit softens and releases its juices during baking, which are then thickened to create a cohesive, sliceable interior for the pie.

- Cooked in shell: Fruit, sweeteners, and thickeners are combined uncooked and then placed directly into an unbaked pie crust. The entire assembly is baked together, allowing the fruit to soften and the filling to thicken within the pie shell. This method is common for firmer fruits like apples.
  - **Examples**: Gallettes, apple pie
- Precooked: The fruit and/or its juices are cooked on the stovetop with sweeteners and thickeners until thickened before being poured into a pie crust. Best for juicier fruits.
  - **Examples**: Blackberry, or mixed berry pie
- Fresh fruit: Fresh fruit is combined with a prepared, typically gelatin- or starch-thickened, and chilled mixture (a pastry cream, gelatin base, or no-bake cheesecake base) and placed into a pre-baked pie crust. These pies are set by chilling rather than baking.
  - **Examples**: Strawberry, peach, or strawberry pretzel pie

Fruit Fillings/Sauces: Fruit fillings/sauces are used to enhance the flavor, appearance, and texture of dishes Typically any fruit can be used in the preparations below.

- Macerated fruit - A technique where fruit is softened and infused with flavor by soaking it in a liquid (sugar, citrus juice) at room temperature or chilled. This process draws out the fruit's natural juices, creating a flavorful syrup, and slightly tenderizes the fruit without cooking it. These are typically served raw.
- Coulis - A pourable sauce made from puréed and strained fruits. Typically cooked, pureed, and strained to create a smooth consistency.
- Compote - A fruit sauce made by gently simmering whole or chopped fruit in sugar syrup, often with added spices like cinnamon, vanilla, or cloves. The fruit remains soft but not fully broken down, so the final texture is chunky and syrupy.
- Jam - A thick, spreadable preserve made by cooking crushed or chopped fruit with sugar and sometimes pectin.
- Jelly - A clear, firm fruit spread made from fruit juice (not the fruit itself), sugar, and usually pectin.

Fruit can also be used in any of the custards in standards 1 & 2 and then put into a final dessert.

Standard 4

Demonstrate the production and use of baking and pastry finishes.

Icing (Frosting): a sweet decorative finish that can be used as a filling or coating on desserts. It is used to add flavor and improve a desserts appearance.

Types of icings

- Buttercream: A light, smooth, fluffy mixture of sugar and fat that may be used as a filling and/or coating on desserts.
  - American: A simple buttercream made by creaming butter and powdered sugar together until the mixture is light and smooth. Cream, pasteurized eggs, and flavorings may be added as desired.
  - Italian/Swiss: Meringue based buttercream made in the same style as the corresponding meringues. Softened butter is whipped into the meringues. This style of buttercream is much lighter than American buttercream.
  - French: A hot sugar syrup is added to egg yolks, softened butter is gradually added and whipped to create a rich custard like buttercream.
  - German: A custard buttercream made from pastry cream and whipped butter

    - Russian: A buttercream made by combining softened butter with sweetened condensed milk until light and fluffy. Flavorings can be added.
- Fondant: A thick, opaque sugar paste commonly used for glazing.
    - Rolled Fondant: A stiff, dough like substance used for covering cakes and for making flowers and other decorations.
- Fudge: Rich and heavy icing made similar to making candy as they are high in sugar and contain less fat than traditional buttercreams, great for layer cakes, loaf cakes and sheet cakes
- Glaze: A thin liquid coating applied to baked goods. They are typically dry to slightly firm, sometimes shiny finish.
- Royal Icing: An uncooked mixture of powdered sugar and egg white that is used for making decorations, especially intricate designs.
- Ganache: A mixture of heavy cream and chocolate can be used as a filling, icing, or glaze.

Other dessert sauces and finishes.

- Caramel: Created by heating sugar until it caramelizes and turns amber in color, then combined with cream, butter, and/or salt. Can be used as a sauce, filling, candy or flavoring.
- Chocolate: A sauce made from chocolate that can be used as a sauce, filling, or flavoring. It varies in consistency (thin and syrupy to thick and fudge like) and can improve the flavor and appearance of desserts.
- Marzipan: A paste made of almonds and sugar and often used in candy making, as a cake filling or finish, and for decorative work.
- Modeling chocolate: Made from combining melted chocolate with corn syrup to a thick moldable consistency. Can be used for decorations and sculpting.
- Gum Paste: A quick-drying paste made primarily from powdered sugar, egg whites, and a gum. It is used for creating delicate and intricate decorations.

Performance Skills

Students will produce two fillings, including a pastry finish.

Durable Skills

Leadership: Students will practice leadership skills in baking fillings and finishings.

Instruct a student to take on the role of a Lead Chef for a small group project. Assign the group the task of preparing a complex baked dessert that requires multiple fillings and finishes (e.g., a Boston Cream Pie with pastry cream filling and ganache topping, or a layered cake with curd and buttercream). Have the student show leadership through delegation, project management, and problem-solving.

- A student can demonstrate leadership by becoming the expert instructor for a specific filling or finishing technique. The student will prepare and present a “Master Class” instructional video for the class.

STRAND 7

Explore a variety of pastry doughs.

Standard 1

Differentiate between the four types of pastry doughs.

Short Dough

- Key Characteristics: a tender and crumbly crust with a high percentage of fat, including butter and egg.
- Examples: tart crust, shortbread

Flaky Dough

- Key Characteristics: Cut in dough using a solid fat, leaves irregular flakes of visible fat.
- Examples: traditional pie crust

Pâte á Choux

- Key Characteristics: Cooked batter that expands when baked. Water, fat, flour, and eggs.
- Examples: eclairs, cream puffs

Laminate Dough

- Key Characteristics: Layers of fat folded and rolled into dough.
    - Two types of laminated dough
        - Puff Pastry: Does not use yeast in the dough
            - Examples: palmier, turnovers
        - Yeasted: Uses yeast in the dough
            - Examples: danishes, croissants

Performance Skills

Students will produce two pastries, including a Pâte á Choux to produce a finished product.

STRAND 8

Explore a variety of cake preparations and finishes.

Standard 1

Explore the preparation techniques of cake batters.

Mixing methods

- Blending method
  - Combine the dry and wet ingredients separately then add wet to dry ingredients together.
  - Examples: Typically liquid fat-based cakes such as carrot cake.
- Creaming method
  - Cream together sugar and fat, add eggs followed by the rest of the ingredients.
  - Examples: Best for high fat cakes like butter cakes and pound cake.
- Reverse creaming method
  - Combine all dry ingredients with softened butter before adding the wet ingredients. In this technique the butter coats the flour, inhibiting gluten development, resulting in a more delicate texture.
  - Examples: Modern layer cakes
  - *Although the creaming and reverse creaming methods differ in technique—particularly in the order and manner in which ingredients are combined—they are both versatile approaches that can yield cakes with identical flavor profiles.
- Foaming method
  - Eggs whipped and beat to incorporate air before it is mixed into a batter. The air whipped into the eggs is used as the leavening agent.
  - Examples: Angel food cake, genoise, sponge, and chiffon.

Standard 2

Practice assembling and finishing cakes.

Layered
Filled
Glazed
Iced/frosted/decorated

Standard 3

Discuss proper holding, storage, and sustainability of cakes.

- Cooling: The cake should be cooled completely before assembling or storing.
- Storage: Frosted cakes should be stored in the refrigerator. Unfrosted cakes can be stored at room temperature for a few days. Many professionals freeze cake layers before decorating to make them easier to work with during the decorating process. Cakes should be stored in an airtight packaging method such as an airtight container or plastic.
- Sustainability: Reusing cake scraps helps to reduce food waste and increase profit for bakeries.
  - Examples: cake bites, cake pops, trifle, or cake crumb as decoration

Performance Skills

Students will produce a complete cake product, including a finish.

Performance Skills

Strand 3
Students will properly weigh ingredients using a scale, to produce a baked good.
Strand 4
Students will produce at least two different varieties of cookies
Strand 5
Students will produce two yeast bread products, using a lean and an enriched dough.
Strand 6
Students will produce two fillings, including a pastry finish.
Strand 7
Students will produce two pastries including a Pâte á Choux to produce a finished product.
Strand 8
Students will produce a complete cake product, including a finish.

Durable Skills

Strand 1
Professionalism: Students will demonstrate professionalism and workplace safety through one of the following.

- Students should dress appropriately for the cooking lab, making sure to follow all personal hygiene responsibilities while working with food.
- Independently conduct a comprehensive food safety audit of their workstation and equipment before and after a baking lab; identifying potential safety hazards and food critical control points.
- The student researches and creates a checklist for a cooking lab based on a professional food safety standard like ServSafe or local health department guidelines.

Strand 3
Adaptability: Students will demonstrate adaptability in baking & pastry production through one of the following.

- Executing a complex baking recipe (e.g., a multi-component pastry or layered cake) within a baking timeline, demonstrating precise scaling, appropriate mixing methods, and accurate oven management. Following the lab, they will complete a self-reflection log, critically analyzing their time management and identifying specific strategies for improvement in future productions.
- Provide a standard baking formula (e.g., a basic cookie recipe) and then present the student with a scenario where a key ingredient is missing or needs to be swapped for a dietary restriction.
- Challenge the students to apply a new baking method to a familiar recipe. The teacher provides a recipe that typically uses one method (e.g., standard creaming method for a cake). The student must then produce the same product using a different method.

Strand 4
Innovation: Students will practice innovation through baking a variety of cookies.

- Develop and produce a new cookie variation based on one of the six established preparation methods, experimenting with ingredients or flavor profiles.
- Challenge a student to innovate with flavor combinations by fusing a cookie with an unexpected culinary influence. Instead of adding standard mix-ins like chocolate chips or nuts, the student must incorporate a flavor from a different cuisine or a savory ingredient.
- Systematically manipulate variables to engineer a cookie with a specific desired characteristic. Instead of just following a recipe, the student conducts a small, scientific experiment to produce a cookie that is either chewier, flatter, or puffier than a standard recipe.

Strand 6

Leadership: Students will practice leadership skills in baking fillings and finishings.

- Instruct a student to take on the role of a Lead Chef for a small group project. Assign the group the task of preparing a complex baked dessert that requires multiple fillings and finishes (e.g., a Boston Cream Pie with pastry cream filling and ganache topping, or a layered cake with curd and buttercream). Have the student show leadership through delegation, project management, and problem-solving.
- A student can demonstrate leadership by becoming the expert instructor for a specific filling or finishing technique. The student will prepare and present a “Master Class” instructional video for the class.

Baking & Pastry Vocabulary

American Culinary Federation (ACF): A professional organization for all chefs and cooks in North America.

Retail Bakers of America (RBA): A trade association representing retail bakeries and their suppliers.

The Bread Bakers Guild of America: An organization dedicated to advancing the craft of artisan bread baking. Bakers' Percentage: A system in baking where each ingredient's weight is expressed as a percentage of the flour's weight.

Docking: Piercing small holes in dough or pastry before baking to prevent bubbles or uneven rising.

Blind Baking: Partially or fully baking a pie or tart crust before adding the filling.

Tempering: Gently heating and cooling ingredients (like chocolate or eggs) to a specific temperature to stabilize them or prevent curdling.

Fold in: A gentle mixing technique where lighter ingredients are incorporated into heavier ones using a spatula, preserving air

Cut in: To combine a solid fat (like butter) with flour using a pastry blender, two knives, or fingertips until crumbly

Cream: To beat fat and sugar together until light, fluffy, and well combined.

Blooming: Softening gelatin in a cold liquid before adding it to a recipe.

Caramelization: The process of cooking sugars until they brown and develop a nutty flavor

Leavening: The production of gas in doughs or batters that causes them to rise.

- Chemical leaveners: Ingredients like baking soda and baking powder that produce gas through chemical reactions to leaven baked goods.
- Organic leaveners: Living organisms, primarily yeast, that produce carbon dioxide through fermentation to leaven dough.
- Physical leaveners: Incorporating air into a mixture (e.g., whipping eggs, creaming butter) to cause it to rise.

Gelatinization: The process where starch granules absorb liquid and swell when heated, thickening mixtures

Proof: The final rising period for yeast dough before baking.

Oven Spring: The rapid increase in volume of a dough or batter during the first few minutes of baking

Gluten: A protein network formed in doughs from flour and water, providing structure and elasticity

Streusel: A crumbly topping made from butter, flour, sugar, and sometimes spices, often used on muffins, coffee cakes, or fruit desserts

Meringue: A foam made from whipped egg whites and sugar.

- Swiss Meringue: Egg whites and sugar heated over a double boiler while whisking, then whipped until stiff and glossy
- Italian Meringue: Hot sugar syrup is slowly poured into whipping egg whites until stiff and glossy.
- French Meringue: Raw egg whites are whipped until soft peaks form, then sugar is gradually added and whipped until stiff peaks.

Pasteurized: A food (especially liquid) that has been heat-treated to destroy harmful microorganisms

Puree: A smooth, thick mixture made from finely blended or sieved fruits, vegetables, or other foods

Steep: To soak a solid ingredient in a liquid (often hot) to extract flavor.

Nappe: A French culinary term meaning to coat the back of a spoon with a sauce or liquid, indicating a certain consistency.

Straight Mixing Method: A yeast bread method where all ingredients are combined and mixed in one step.

Sponge Mixing Method: A yeast bread method where a portion of the flour, water, and all the yeast are mixed to form a "sponge" that ferments before remaining ingredients are added.

Brioche Mixing Method: A method for rich, enriched yeast doughs that involves incorporating a large amount of butter after initial mixing.

Stirred Custard/Pudding: A custard cooked on the stovetop while continuously stirred until thickened.

Pastry cream (Creme Patisserie): A thick, rich custard made with eggs, sugar, milk, and a starch, used as a filling for pastries and tarts

- Diplomat cream: Pastry cream lightened with whipped cream
- Creme legere: Pastry cream lightened with meringue.
- Creme mousseline: Pastry cream enriched with butter.
- Creme chiboust: Pastry cream lightened with Italian meringue.

Creme Anglaise: A light pouring custard sauce made from egg yolks, sugar, and hot milk or cream, often flavored with vanilla

Curd: A thickened, tangy mixture made from fruit juice (usually citrus), sugar, eggs, and butter

Coulis: A thin fruit or vegetable purée, often strained, used as a sauce or garnish.

Compote: A chunky fruit sauce made by cooking fruit (whole or cut) in a sugar syrup.

Fondant (Rolled Fondant): A pliable sugar paste used to cover and decorate cakes, creating a smooth, matte finish

Fudge (icing): A thick, dense, cooked icing often made with sugar, butter, milk, and chocolate.

Glaze: A thin, often shiny coating applied to baked goods, made from sugar, liquid, and sometimes flavorings.

Royal Icing: A hard, decorative icing made from powdered sugar, egg whites, and sometimes lemon juice, used for piping intricate designs

Ganache: A rich, smooth mixture of chocolate and cream, used as a filling, frosting, or glaze

Caramel (sauce/finish): Sugar cooked until it melts and turns a golden-brown color, often used as a sauce or flavoring.

Chocolate (sauce/finish): A sauce or finishing element made from chocolate, often with cream or milk.

Marzipan: A sweet, pliable paste made from ground almonds and sugar, used for molding, decorating, or covering cakes.

Modeling chocolate: A malleable paste made from melted chocolate and corn syrup (or glucose), used for sculpting and decorating

Gum Paste: A dough-like edible paste made primarily from powdered sugar, egg whites, and gum tragacanth (or CMC powder), used for creating delicate, thin, and durable edible decorations.

Short Dough: A rich, tender pastry dough with a high fat content, typically used for tarts and pie crusts.

Flaky Dough: A pastry dough characterized by distinct layers of fat and dough, resulting in a flaky texture when baked, often used for pie crusts or savory pastries.

Pâte á Choux: A light, airy pastry dough made from water (or milk), butter, flour, and eggs, used to make éclairs, cream puffs, and gougères

Laminate Dough: A dough created by repeatedly folding and rolling butter (or other fat) into a dough, producing many thin layers when baked

- Puff Pastry: A type of laminate dough that bakes into many thin, crisp, buttery layers without the use of yeast.
- Yeasted: Laminated dough that also includes yeast, such as for croissants or Danish pastries

Blending method: A cake mixing method where all dry ingredients are blended, then all wet ingredients are added and mixed.

Creaming method: A cake mixing method where fat and sugar are beaten together until light and fluffy before other ingredients are added

Reverse creaming method: A cake mixing method where dry ingredients are mixed with fat first, then liquids are gradually added

Foaming method: A cake mixing method where whipped eggs (whole or whites) provide the primary leavening and structure.

STRANDS AND STANDARDS

PROSTART LEVEL 1

Learning that works for Utah CTE®

Course Description

Prostart® I is a professional start to the Foodservice and Culinary Arts industry. It is a program sponsored by the National Restaurant Association Educational Foundation. The ProStart® curriculum, introduces students to career opportunities in the restaurant and foodservice industry and provides them with foundational skills in culinary arts and restaurant management that will jump-start their post-secondary experience, in college and/or careers.

***refer to the addendum for specific information.**

Intended Grade Level	10-12
Units of Credit	1.0
Core Code	34.01.00.00.255
Concurrent Enrollment Core Code	34.01.00.13.255
Prerequisite	Culinary 1, Prostart 2 can be taken before Prostart 1.
Skill Certification Test Number	931
Skill Certification Cut Score	**N/A**
Test Weight	1.0
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	FCS General
Endorsement 2	Food Services/Culinary Arts

Updated: JULY 2025

STRAND1

Students will explore the food service and hospitality industry.

Standard 1 – Welcome to the Industry

- Differentiate among the eight types of dining establishments.
- Describe the commercial and noncommercial segments of the restaurant and foodservice industry, including examples of businesses in each segment.
- List examples of businesses within the three segments of the hospitality industry.
- Recognize key historical, social, scientific, and political advances in the world that affected the evolution of the restaurant and foodservice industry.
- Explain the role of entrepreneurs in the growth of the restaurant and foodservice industry.
- List examples of how chefs have been critical to the growth of the restaurant and foodservice industry.

STRAND 2

Students will explore the career opportunities in the restaurant/foodservice and hospitality industry.

Standard 1 – Career Opportunities

- Explain the importance of entry-level jobs to people interested in the foodservice industry.
- List and describe the roles of typical back-of-house staff and front-of-house staff.
- List and describe the roles of typical restaurant management and support staff.
- Describe the nine common job skills important in the restaurant and foodservice industry.
- Explain the value of working with a mentor to develop career skills.
- List common ways of working on your professional development.
- Describe how professionals network and why it is important.

STRAND 3

Students will keep food safe through the proper use of food handling and sanitation techniques.

Standard 1 – Introduction to Food Safety

- Define a foodborne-illness outbreak.
- Explain the costs associated with a foodborne-illness outbreak.
- Identify those at high risk of contracting a foodborne illness.
- List the ways food can become unsafe.
- Define FAT TOM.
- Break down the characteristics of TCS food.
- Explain how to identify and prevent cross-contamination.
- Define “time-temperature abuse.”
- Compare different thermometer types and explain how each type helps keep food safe.
- Name the most common food allergens.
- Explain the methods for preventing allergic reactions to food.
- Summarize why a food defense system is needed.
- Name the government agencies that regulate the restaurant and foodservice industries.
- Explain what a food safety management system is and how it work

STRAND 4

Students will demonstrate effective back-of-the-house procedures.

Standard 1 – The Back of the House

- Define "back of the house," and describe some careers that are in the back of the house.
- List some examples of restaurant terminology.
- Describe the concept of mise en place.
- Differentiate between an approved food source and a non-approved food source.
- Precisely describe the criteria for accepting or rejecting food during receiving.
- Explain the correct procedures for storing foods.
- Explain correct procedures for preparing and cooking various foods.
- Describe in detail how to safely hold, cool, and reheat various foods.
- Name the correct procedures for preparing and serving food for off-site service.

STRAND 5

Students will determine front-of-the-house basics for successful service.

Standard 1- Front of the House

- Compare the duties, roles, and responsibilities of each service staff role.
- Explain the process for handling guest reservations and special requests.
- Indicate the appropriate way to greet guests and take their orders tableside.
- Illustrate how suggestive selling benefits a foodservice operation.
- Differentiate between contemporary service styles and three traditional service styles.
- Describe how to properly set and clear items from a table.
- Identify the types of hot and cold beverages, and describe how they are served.
- Understand the steps in processing guest payments.

STRAND 6

Students will create a career plan for an effective comprehensive job search within the food service and hospitality industry.

Standard 1- Preparing for a career

- List practical factors to consider when beginning a job search.
- Identify sources of information about job opportunities.
- Describe the components of a strong résumé.
- Explain how a job applicant should approach the task of filling out an application.
- Describe the ways in which you can prepare for a job interview and demonstrate professionalism during the interview.
- Review commonly asked interview questions and plan appropriate responses.
- Describe the appropriate way to follow up after a job interview.
- Explain the use of assessment tests in the interviewing and hiring process.
- Describe the types of culinary schools and programs that can advance your career.

STRAND 7

Students will demonstrate professionalism in the foodservice industry.

Standard 1 - Professional Expectations

- Define professionalism as it relates to the foodservice industry.
- List the basic expectations for all employees in the foodservice industry.
- Describe the optimal attitude for a restaurant employee.
- Recognize the benefits of teamwork in the foodservice workforce.
- Explain the link between your personal health and wellness and success in your job.
- List ways of avoiding and managing stress.
- Identify time management strategies.

STRAND 8

Students will demonstrate effective communication.

Standard 1- Communication Skills

- Explain the eight elements of the communication process.
- Summarize tips for effective speaking.
- Describe the benefits of active listening.
- Explain the steps of effective writing, with an emphasis on writing in the workplace.
- Summarize the essentials of workplace message etiquette.
- Recognize common barriers to effective communication and explain how to prevent and manage them.

STRAND 9

Students will elaborate workplace safety procedures.

Standard 1- Workplace Safety Procedures

- Recognize the risks for injuries in the restaurant and foodservice industry.
- Identify the personal protective equipment used in foodservice operations.
- Outline measures for preventing slips, trips, and falls in the workplace.
- Demonstrate how to use ladders safely and properly lift and carry items.
- Explain the importance of first aid, cardiopulmonary resuscitation (CPR), and the abdominal thrust maneuver in the workplace.
- Recognize measures foodservice operations take to prevent and detect fires.
- Describe the four classes of fires and the corresponding appropriate fire extinguishers.
- List the steps to take when a fire is too large for you to safely fight.
- Classify burn injuries and their appropriate treatment.
- Identify other threats to workplace and interpersonal safety.

STRAND 10

Students will identify principles of Customer Service.

Standard 1- Principles of Great Service

- Define service and hospitality.
- Explain how service and hospitality affect an operation's success.
- Explain the importance of first impressions for restaurant and foodservice operations.
- Describe the best way to identify a guest's needs.
- Identify guests' special needs that restaurant staff should be able to accommodate.
- Explain the importance of guest feedback.
- Identify methods used for collecting guest feedback.
- Identify the best way to resolve guest complaints.

STRAND 11

Students will demonstrate proper personal hygiene and cleanliness.

Standard 1- Hygiene and Cleanliness

- Identify personal behaviors that contaminate food.
- Recall proper personal hygiene practices and work attire.
- Demonstrate the steps for correct handwashing, and describe when hands should be washed.
- Explain how ready-to-eat food should be handled.
- Evaluate when food handlers should be prevented from working with or around food.
- Contrast cleaning and sanitizing.
- List the correct procedures for cleaning and sanitizing tools and equipment.
- State the factors that influence the effectiveness of sanitizers.
- Describe the elements of a master cleaning schedule.
- Outline the correct procedure for managing pests.

STRAND 12

Students will identify foodservice equipment used in a food service operation.

Standard 1- Foodservice Equipment

- Identify the equipment needed for receiving and storing food and supplies.
- Describe the preparation equipment used in the foodservice kitchen.
- List the equipment needed for holding and serving food and beverages.

STRAND 13

Students will practice the proper use of knives and smallwares in a food service operation.

Standard 1- Knives and Smallwares

- Describe the hand tools and small equipment needed for pre-preparation.
- Identify the different types of knives used in the foodservice kitchen, and describe their common uses.
- Outline how to correctly use knives.
- Explain the classic knife cuts.

STRAND 14

Students will identify the kitchen basics.

Standard 1- Kitchen Basics

- Describe the major positions in a modern, professional kitchen.
- Define mise en place.
- Differentiate between seasoning and flavoring.
- Describe some basic pre-preparation techniques.

STRAND 15

Students will practice basic culinary math skills.

Standard 1- Culinary Math

- Describe the basic math calculations using numbers and fractions.
- Describe the components and functions of a standardized recipe.
- Describe how to convert recipes to yield smaller and larger quantities based on operational needs.
- Explain the difference between customary and metric measurement units.
- Explain how to convert between customary and metric measurements.
- Explain how to measure by volume, weight, and count.
- Explain how to calculate the amounts for something as purchased (AP) and as an edible portion (EP).
- Explain how to calculate the cost and portion cost of a standardized recipe.

STRAND 16

Students will identify and prepare salads, dressings and dips

Standard 1- Salads, Dressings, and Dips

- Describe the roles of salads on the menu.
- Identify ingredients used to make salads.
- Explain procedures for cleaning and storing salad greens.
- Explain the purpose of each of the four parts of a salad.
- Identify important types of salad.
- Describe how to prepare the various types of salads.
- Compare and contrast various oils and vinegars.
- Explain how to prepare vinaigrettes and emulsions.
- Identify common dips.
- Describe how to prepare common dips.

STRAND 17

Students will identify and prepare different types of sandwiches and pizza.

Standard 1- Sandwiches and Pizza

- Identify the basic kinds of sandwiches and their main components.
- Describe the roles of the three main elements of a sandwich.
- Identify the necessary tools and equipment needed at a sandwich station.
- Explain how to prepare different types of sandwiches.
- Identify the basic kinds of pizza and their main components.
- Explain how to prepare different types of pizza.

STRAND 18

Students will identify and prepare different types of stocks, sauces, and soups.

Standard 1- Stocks, Soups, and Sauces

- Identify the four essential elements of a stock and the proper ingredients for each.
- Classify the various types of stock and their specific ingredients.
- Outline the three methods for preparing bones for stock.
- List the ingredients for two to three types of stock.
- Explain how and why to remove fat from stock.
- Recall the proper way to cool stock.
- Summarize how to prepare mother sauces and what derivative sauces are made from them.
- Identify the proper ingredients for sauces.
- Describe how to prepare different kinds of sauces.
- Explain how to match a sauce to the appropriate type of food.
- Recall the two basic kinds of soup.
- Identify the basic ingredients for clear soups (broth and consommé) and thick soups (cream and purée), and differentiate their preparations.

STRAND 19

Students will identify and practice appropriate cooking methods.

Standard 1- Cooking Methods

- Differentiate how heat transfers to food through conduction, convection, and radiation.
- List the types of dry-heat cooking methods and recommend which food items are best suited for them.
- Describe moist-heat cooking and recommend which food items are best suited for it.
- Explain what combination-heat cooking is and recommend which food items are best suited for it.
- Describe the sous vide and microwave cooking techniques.
- Explain how to determine when food is done cooking.

STRAND 20

Students will identify and demonstrate basic baking techniques.

Standard 1- Introduction to Baking

- Identify the main ingredients used in baking.
- Explain the key purpose for each of the main baking ingredient types.
- Explain how to calculate the ingredient weights in a recipe using baker's percentages.
- Explain how to convert to a new recipe yield using baker's percentages.
- Describe the six types of cookies.
- Define quick breads.
- Explain how the three types of quick breads are prepared.

STRANDS AND STANDARDS

PROSTART LEVEL 2

Course Description

ProStart® Level 2 is a companion to ProStart® Level 1 from the National Restaurant Association Educational Foundation. ProStart® is a program of the National Restaurant Association Educational Foundation. This course introduces students to career opportunities in the restaurant and foodservice industry and provides them with foundational skills in culinary arts and restaurant management that will jump-start their post-secondary experience, in college and/or careers. Prior to beginning ProStart®11, teachers should review safety, sanitation and kitchen essentials with their students found in the ProStart® Level 1 textbook.

***refer to the addendum for specific information**

Intended Grade Level	10-12
Units of Credit	1.0
Core Code	34.01.00.00.257
Concurrent Enrollment Core Code	34.01.00.13.257
Prerequisite	Culinary 1, Prostart 2 can be taken before Prostart 1
Skill Certification Test Number	932
Skill Certification Cut Score	**N/A**
Test Weight	1.0
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	FCS Comprehensive
Endorsement 2	Culinary Arts

Updated: JULY 2025

STRAND 1

Students will be able to develop, analyze, and strategically plan a comprehensive restaurant concept.

Standard 1- Defining your concept and market

- Identify the vital elements of a restaurant concept.
- Develop your own restaurant concept.
- Compare and evaluate different types of restaurant floor plans.
- Identify the details of restaurant interior design.
- Explain how the four Ps influence the marketing of your operation.
- Identify the major components of sustainable food practices.
- Identify the steps in a typical marketing plan.
- Perform a SWOT analysis.
- Compare activities included in the promotional mix.
- Describe how community relations benefit a restaurant owner/operator.
- Identify and describe the components of a business plan.

STRAND 2

Students will examine the development, construction and management of menu concepts.

Standard 1- Menu Development and Management

- Identify the four major factors to consider when determining a restaurant's cuisine and menu offerings.
- Explain the link between demographic information about a community and a restaurant meeting its target market's needs.
- Describe the major functions of a menu.
- Compare and contrast the different types of menus.
- Analyze a menu in terms of its medium and its design elements.
- Calculate the price of a menu item using the food cost percentage method.
- Define the Q factor and its significance to restaurant profitability.
- Explain the purposes of a menu sales mix analysis.
- Describe the characteristics of the four classifications of menu items.
- List strategies for optimizing a menu based on the menu classifications.

STRAND 3

Students will identify methods of cost control including budgets.

Standard 1- Introduction to Cost Control

- Recognize why cost control is important for a foodservice business.
- Examine the balance between sales and costs necessary to make a profit.
- Distinguish between the different types of foodservice costs.
- Investigate the relationship between sales and labor costs.
- Explore why businesses use budgets and profit and loss reports.
- Explain how forecasting helps control foodservice costs.
- Identify and evaluate the tools that help control foodservice costs.
- Assess ways to reduce food waste.

STRAND 4

Students will describe the effects of food, beverage and labor costing to a business's success.

Standard 1- Food, Beverage, and Labor Costing

- Identify methods of cost control in the flow of food.
- Analyze how quality control affects costing in the flow of food.
- Define and calculate food and beverage cost and food cost percentage.
- Recognize the importance of inventory value as it relates to cost control.
- Calculate a recipe yield and the number of portions it will produce.
- Develop a recipe cost card for a standardized recipe.
- Analyze plate cost and drink cost.
- Formulate a new yield for an existing recipe using a conversion factor.
- Explain the importance of portion control.
- Describe how to evaluate a finished product for quality.
- Analyze the relationship between sales volume and labor costs.
- Understand how prime cost affects labor costing.
- Distinguish between types of schedules typically used in a foodservice operation.
- Describe how to write a schedule to achieve labor goals.

STRAND 5

Students will evaluate purchasing and inventory procedures.

Standard 1- Purchasing, Receiving, and Managing Inventory

- Identify the common goods and services purchased by restaurants and foodservice operations.
- Outline the steps of purchasing for restaurants and foodservice operations.
- Describe the role and goals of buyers in the industry.
- Explain the relationships between primary sources, intermediary sources, and retailers within the channel of distribution.
- Compare the formal and informal buying processes.
- Name factors that can affect the price of food.
- List the factors that affect a restaurant’s quality standards.
- Describe the characteristics of clear, complete, well-written product specifications.
- Outline buyer considerations when conducting a make-or-buy analysis.
- List the tools that help buyers effectively plan their operation’s purchasing needs.
- Explain the significance of safe, effective, and efficient receiving processes to a restaurant or foodservice operation.
- List the key principles of properly storing goods delivered to restaurants and foodservice operations.
- Explain the purpose of formal issuing procedures.
- Describe perpetual inventory and physical inventory systems.

STRAND 6

Students will identify the characteristics of eggs and dairy products.

Standard 1- Eggs and Dairy Products

- List the various types of milk and milk alternatives available today and explain how they differ from each other.
- Describe the various types of cream available today and explain how they differ from each other.
- Define cultured dairy products and explain what fat content these products have.
- Describe best practices for receiving and storing milk, cream, and cultured dairy items
- Explain the differences between butter and butter substitutes.
- Name the primary kinds of cheese.
- List the parts of an egg and explain how to keep eggs safe.
- Name some different ways to cook an egg.

STRAND 7

Students will explore the facets of breakfast foods.

Standard 1- Breakfast Cookery

- Describe the types of breakfast service.
- Explain how to prepare pancakes, crêpes, waffles, and French toast.
- Describe how to prepare various breakfast meats.
- Explain how to prepare various breakfast starches.

STRAND 8

Students will explore and utilize fruits.

Standard 1- Fruits

- Classify the various types of fruit.
- List factors that affect purchasing decisions regarding fruit.
- Explain how fruit should be stored.
- Identify various methods for preparing fruit.
- Describe various methods for cooking fruit.

STRAND 9

Students will explore and utilize vegetables.

Standard 1- Vegetables

- Describe the various types of vegetables.
- List factors that affect purchasing decisions regarding vegetables.
- Explain how vegetables should be stored.
- Differentiate among various methods for preparing vegetables.
- List various methods for cooking vegetables.
- Explain how to hold vegetables for safety and quality.

STRAND 10

Students will articulate different types grains, legumes, potatoes, and pasta.

Standard 1- Potatoes, Grains, and Pasta

- Describe three or more types of potatoes and their characteristics.
- Explain how potatoes should be stored.
- List three or more methods of preparing potatoes.
- Name three or more types of grains and legumes and list their characteristics.
- Explain how grains and legumes should be stored.
- Describe two or more methods of preparing various types of grains and legumes.
- List three or more types of pasta.
- Explain two or more methods of preparing pasta.
- Name two or more methods of preparing dumplings.

STRAND 11

Students will be able to apply fundamental leadership and management principles to effectively oversee operations.

Standard 1- Introduction to Management

- Outline the major responsibilities of a manager.
- Formulate a vision statement and a mission statement.
- Define SMART goals.
- Explain how a manager builds a successful team.
- Understand the laws that govern hiring and training employees.
- Analyze the common expectations employees have of managers.
- Explain why diversity is important in a workplace and how it can be promoted.
- Evaluate the style, skills, and characteristics of a leader.
- Understand the steps for solving a problem.

STRAND 12

Students will be able to manage and mitigate operational risks within a foodservice environment.

Standard 1- Risk Management

- Understand how to manage operational risks in a foodservice operation.
- Explain the role of the general safety audit in risk analysis and risk management.
- Determine the role of Occupational Safety and Health Administration (OSHA) regulations in risk management.
- Explain the purpose of the Hazard Communication Standard (HCS) requirements for foodservice owners and managers.
- Analyze how a workplace safety program addresses harassment, bullying, and other abuse
- Understand the guidelines for handling harassment, bullying, and abuse claims.

STRAND 13

Students will apply nutrition concepts to build healthful menus.

Standard 1- Nutrition and Healthy Menus

- Explain why nutrition is important to the restaurant and foodservice industry.
- List the five food groups that are part of the MyPlate nutrition model.
- Describe how phytonutrients and fiber function in the body.
- Explain the role that carbohydrates play in people's diets.
- List at least three reasons fats are necessary in people's diets.
- Explain what proteins do and list at least three foods that have them.
- Differentiate between vitamins and minerals.
- Describe how water benefits the human body.
- Differentiate between vegetarian and vegan diets.
- Describe at least two food preparation techniques that preserve nutrients.
- Give at least three examples of modifications that can make meals healthier.
- Differentiate between "natural" and "organic" on a food label.

STRAND 14

Students will identify the various forms of meat and its preparation.

Standard 1- Meat

- Classify the different grades of meat..
- Identify different cuts of meat from various animals.
- Explain the procedures for receiving meat.
- Outline the basic ways to cook and prepare meat.
- Identify the best ways to cook specific forms of meat.

STRAND 15

Students will identify the various forms of poultry and its preparation.

Standard 1- Poultry

- Describe the various grades of poultry.
- Identify different forms of poultry.
- Outline the procedures for receiving poultry.
- Explain how to fabricate poultry.
- Review the basic cooking techniques used to prepare poultry.
- Compare and contrast specific methods for handling different forms of poultry.

STRAND 16

Students will identify the various forms of seafood and its preparation.

Standard 1- Seafood

- Describe the inspection and grading process for seafood.
- Name at least three forms of seafood.
- List the procedures for receiving seafood.
- Explain the best way to fabricate seafood.
- Differentiate between sushi, maki, and nigiri.
- Describe at least two basic cooking methods for seafood.
- Explain how to tell when fish is fully cooked.

STRAND 17

Students will demonstrate knowledge of yeast bread preparation.

Standard 1- Yeast Breads

- Identify the basic types of yeast bread dough.
- Describe key features of each kind of yeast bread dough.
- Identify the two basic methods used to make yeast breads.
- Compare and contrast the two methods for making yeast bread.
- Describe advantages and disadvantages of different types of yeast.
- Identify the 10 basic steps of making yeast bread.

STRAND 18

Students will demonstrate proficiency in preparing cakes and pies.

Standard 1- Cakes and Pies

- Describe cake batters and how they are prepared.
- Identify the three basic purposes for icing and the various types of icing.
- Explain how to prepare icing.
- Identify the types of soufflés.
- Explain how to make a soufflé.
- Describe a 3-2-1 pie dough, and explain how it is prepared.
- Describe laminated dough, pâte à choux, and phyllo dough.
- Explain how each type of pastry dough is prepared.

STRAND 19

Students will demonstrate various dessert preparations.

Standard 1- Desserts

- Explain how chocolate is made, including its main ingredients.
- Explain how to temper and store chocolate.
- Explain how to prepare baked and stirred custards.
- Explain how custards are used in desserts.
- Identify the different types of frozen desserts.
- Describe differences in frozen desserts.
- Describe poached fruit and tortes.
- Define dessert sauces.
- Identify the main types of dessert sauces.
- Describe how different dessert sauces are made.

STRAND 20

Students will practice proper plating techniques.

Standard 1- Modern Plating

- Explain why and how to use garnishes.
- List the guidelines for plating food.
- Explain how soups should be garnished.
- Describe how desserts should be plated and presented.

Public Service and Safety

Protective Services		
Course Code	**Course**	**Changes**
40.06.00.00.110	Wildland Firefighter	New course

STRANDS AND STANDARDS
WILDLAND FIREFIGHTER

Course Description

This course is designed to meet the Wildland Firefighter knowledge and skill requirements for NFPA 1051, Wildland Firefighter Professional Qualifications. The course teaches students to recognize the "situation that shout Watchout", apply the appropriate Standard Fire Orders and how to deploy a fire shelter. It includes orientation to the Incident Command System. It teaches basic fireline construction, fire weather, and fire behavior. Each subject covered in this course meets and/or exceeds National Wildfire Coordinating Group (NWCG) standards for the following classes: S-130, S-190, I-100, and L-180.

Intended Grade Level	12
Units of Credit	0.5
Core Code	40.06.00.00.110
Concurrent Enrollment Core Code	40.06.00.13.110
Prerequisite	None
Skill Certification Test Number	NA
Test Weight	NA
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Fire Science
Endorsement 2	
Endorsement 3	

STRAND 1

Students will describe the basic terminology used in Wildland Fire.

Standard 1

Utilizing pictures and images, students will identify the parts of a wildfire.

- Head
- Flank
- Rear/Heel
- Black
- Perimeter
- Finger
- Spot Fire
- Pocket
- Origin
- Green
- Island

Standard 2

Define the following terms related to suppression and fire behavior.

- Suppression:
  - Anchor point
  - Control line
  - Fireline
  - Mop-up
  - Contained
  - Controlled
  - Chain
- Fire Behavior:
  - Smoldering
  - Creeping
  - Running
  - Spotting
  - Torching
  - Flare-up
  - Fire whirl
  - Backing
  - Flaming front
  - Crowning

STRAND 2

Students will identify and discuss the fire triangle.

Standard 1

Identify and label the three sides of the fire triangle.

- Fuel
- Oxygen
- Heat

Standard 2
Discuss how to break the fire triangle in the wildland setting.
- Cooling
- Smothering
- Starvation/Separation

STRAND 3
Students will describe the methods of heat transfer.

Standard 1
Define the methods of heat transfer.
- Conduction
- Convection
- Radiation

Standard 2
Recognize how heat transfer methods impact the wildland fire behavior.

STRAND 4
Students will identify critical fire weather factors that, combined with receptive fuels, may result in extreme fire behavior.

Standard 1
Describe critical fire weather events:
- Cold fronts
- Thunderstorms
- Winds
- Other

Standard 2
Recognize pyro-cumulus, a phenomena created by large wildfires.

STRAND 5
Students will recognize how alignment of fuels, weather, and topography can increase the potential for extreme fire behavior.

Standard 1
Describe how the primary wildland fire environment components - fuels; weather; and topography; are made more complex by interaction with each other.

Standard 2
Describe how alignment of these components greatly increases the potential for extreme fire behavior.

STRAND 6

Students will describe the purpose of the Standard Firefighting Orders and Watch Out Situations.

Standard 1

List the 10 Standard Firefighting Orders

1. Keep informed on fire weather conditions and forecasts.
2. Know what your fire is doing at all times.
3. Base all actions on the current and expected behavior of the fire.
4. Identify escape routes and safety zones and make them known.
5. Post lookouts when there is possible danger.
6. Be alert. Keep calm. Think clearly. Act decisively.
7. Maintain prompt communications with your forces, your supervisor. and adjoining forces.
8. Give clear instructions and be sure they are understood.
9. Maintain control of your forces at all times.
10. Fight fire aggressively, having provided for safety first.

Standard 2

List the 18 Watch Out Situations

1. Fire not scouted and sized up.
2. In country not seen in daylight.
3. Safety zones and escape routes not identified.
4. Unfamiliar with weather and local factors influencing fire behavior.
5. Uninformed on strategy, tactics, and hazards.
6. Instructions and assignments not clear.
7. No communication link with crew members or supervisor.
8. Constructing line without safe anchor point.
9. Building fireline downhill with fire below.
10. Attempting frontal assault on fire.
11. Unburned fuel between you and fire.
12. Cannot see main fire; not in contact with someone who can.
13. On a hillside where rolling material can ignite fuel below.
14. Weather becoming hotter and drier.
15. Wind increases and/or changes direction.
16. Getting frequent spot fires across line.
17. Terrain and fuels make escape to safety zones difficult.
18. Taking a nap near fireline.

Standard 3

Identify and discuss common denominators on tragedy fires.

- Communication
- Fire behavior
- Terrain
- Fuel Type

Standard 4

Identify and discuss appropriate watch out situations in given scenarios (teacher provided).

Standard 5

Apply appropriate Standard Firefighting Orders to minimize the potential for serious injury or death.

STRAND 7

Students will describe what the Lookouts, Communications, Escape Routes, and Safety Zones (LCES) system is and how it relates to the Standard Firefighting Orders.

Standard 1

Define Escape Route, Escape Time and Safety Zone.

Standard 2

Identify travel barriers that will affect escape time.

- Terrain
- Fuel Load
- Fuel Type
- Fitness Level

Standard 3

List the three types of safety zone categories and describe one example of each.

- Burn
- Natural Features
- Structural Features

Standard 4

Describe the difference between deployment sites and safety zones.

Standard 5

Describe the limitations of utilizing the Incident Response Pocket Guide safety zone guidelines.

STRAND 8

Students will describe the various communication methods and tools used for collecting, producing, and distributing information.

Standard 1

Define Situational Awareness and explain why it is important.

Standard 2

List the five communication responsibilities.

- Brief others as needed.
- Debrief your actions.
- Communicate hazards to others.
- Acknowledge messages.
- Ask if you don't know.

Standard 3

Understand the nine parts of a fire and other useful firefighting terms.

- Origin
- Head
- Flank (right and left)
- Rear/Heel
- Perimeter
- Finger

- Pocket
- Island
- Spot Fire

Standard 4

Recognize and understand basic firefighter terminology and other useful terms.

- Control Line
- Fireline
- Anchor Point
- Mop-up
- Class of Fire

STRAND 9

Students will describe the standards, tools and equipment, and various methods used in fireline construction.

Standard 1

Discuss the purpose of inspecting and properly maintaining hand tools.

Standard 2

Explain the limitations, capabilities and ideal tool order of various, common wildland hand tools.

- Pulaski
- Shovel
- Combi-tool
- Swatter
- McLeod

STRAND 10

Students will describe the methods for extinguishing a fire with or without the use of water.

Standard 1

Describe three methods for breaking the fire triangle.

- Cooling
- Smothering
- Starvation/Separate

Standard 2

Identify and describe the different methods of attack.

- Direct Attack
- Indirect Attack
- Flanking

Standard 3

List variable factors that influence standards for fire line construction.

- Fuel
  - Type
  - Moisture
  - Load

- Weather
  - Wind
  - Temperature
  - Humidity
- Topography
  - Slope
  - Aspect
  - Terrain
- Fire Behavior
  - Rate of Spread
  - Flame height
  - Spotting potential

Standard 4
Discuss the construction of a fire control line with given variables utilizing wildland fire hand tools.

Standard 5
Identify and provide examples of a constructed and natural control line.
- Handline
- Machine line (dozer, tractor plow, etc.)
- Wet line
- Retardant line
- Blackline
- Constructed barriers
- Bodies of water
- Areas of sparse fuel (rock slides)
- Cold fire edge/fire scars

Standard 6
Explain and discuss the purpose of “Mop-up”.

Standard 7
Discuss the limitations and capabilities of simple and progressive hose lays.

Standard 8
Discuss safety precautions/actions for near a water/retardant drop from aviation and other heavy equipment.

STRAND 11
Students will explore the role of human performance and mental readiness in fireline operations.

Standard 1
Define "human factors" and describe how they influence safety and behavior on the fireline.
- Fatigue
- Inexperience
- Distractions
- Stress
- Hazardous attitudes

Standard 2
Describe the concept of situational awareness and explain its importance in emergency environments.
- Gathering information (look up, look down, look around)
- Recognition
- Option selection
- Decision point
- Action
- Re-evaluate/change

Standard 3
Identify the warning signs of loss of situational awareness and analyze case studies where it contributed to fireline incidents.
- Attitudes/opinion
- Stress
- Perception
- Fatigue
- Evolving situation

Standard 4
Apply a basic risk management process to a simulated firefighting scenario.
- Define the context
- Identify potential risk
- Assess and analyze
- Develop alternative plans
- Deciding and implementing
- Evaluating and monitoring

STRAND 12
Students will understand the impact of communication, leadership, and team dynamics on fireline performance.

Standard 1
Describe how communication errors contribute to accidents in high-risk environments.

Standard 2
Identify effective leadership traits and explain the difference between leading and following in wildland fire teams.

Standard 3
Demonstrate the use of clear, concise communication in simulated team-based fireline activities.

Standard 4
Recognize and explain the NWCG leadership values.
- Duty
- Respect
- Integrity

STRAND 13

Students will examine how stress, fatigue, and mental performance impact personal safety and crew cohesion.

Standard 1

Identify the signs of stress and fatigue and explain their effects on performance and decision-making.

- Decreased motivation and moral
- Poor decision making
- Limited situational awareness
- Exhaustion
- Alarm resistance

Standard 2

Compare healthy and unhealthy stress-management strategies for wildland firefighters.

Standard 3

Explore the impact of safety culture and lessons learned from past wildland fire incidents.

Standard 4

Explain how individuals contribute to a strong safety culture within a fire organization.

STRAND 14

Students will summarize the process for application and advancement within the career of Wildland Firefighting.

Standard 1

Understand the application and hiring process for federal and local wildland fire agencies.

Standard 2

Explain the purpose of a Position Task Book and understand the professional development process within Wildland Career Path and Position Catalog (PMS310-1).

Standard 4

Understand the physical standards and expectations of completing a pack test in 45 minutes and/or complete a mile and half run in 13:00.

Performance Skills

1. Demonstrate the proper use of a portable radio by transmitting and receiving information.
2. Demonstrate the care, inspection, and maintenance of protective clothing.
3. Demonstrate the proper wearing of PPE.
4. Demonstrate action to be taken during and after an air retardant drop.
5. Demonstrate the proper deployment of a fire shelter.
6. Demonstrate techniques for inspecting, maintaining, and sharpening hand tools.
7. Demonstrate how to retrieve fire line hose using the single section drain and carry.
8. Demonstrate how to retrieve fire line hose using a figure 8 technique.
9. Demonstrate the proper procedures for carrying hand tools and passing crew members while working on a fire line.
10. Demonstrate proper procedures for passing cutting tools.

11. Demonstrate the proper use of a fire swatter.
12. Demonstrate the proper procedures for assembly, use, and maintenance of a backpack pump.
13. Simulate the proper igniting, use, and extinguishment of a fuse.
14. Demonstrate the proper procedures for assembling a drip torch.
15. Simulate the proper procedures for mixing fuel and fill a drip torch.
16. Simulate the proper procedures for lighting, using and extinguishing a drip torch.
17. Simulate the proper procedures for storage of a drip torch after use.
18. Demonstrate the proper use of tools and appliances during hose lay operations: simple/extended hose lay.
19. Demonstrate the proper use of tools, appliances, and fittings during hose lay operations: progressive hose lay.
20. Demonstrate proper use of hand tools while building a fire control line.
21. Demonstrate the proper building of a cup trench on a slope.
22. Demonstrate the proper building of a control line using the “bump up” or “one lick” technique.
23. Demonstrate a wet mop-up.
24. Demonstrate a dry mop-up.
25. Demonstrate cold trailing of a fire.
26. Demonstrate follow-up procedures for securing a control line.
27. Assemble and prepare for a response.
28. Produce a resume and cover letter for mock interviews in preparation for opportunities for job position openings within wildland firefighting.
29. Conduct an “after-action” review.

Skill Certification Test Points by Strand

This is a new course, no exam yet.

Durable Skills

- Professionalism
- Collaboration
- Communication
- Leadership
- Innovation
- Adaptability

KEY VOCOBULARY CLARIFICATIONS

Anchor Point: An advantageous location or point from which to start constructing a fireline, usually a natural or artificial barrier to fire spread.

Aspect: The direction a slope faces.

Backing: Fire spreading against the wind or downhill.

Blackline: A constructed control line where fuels are burned out to create a wider buffer.

Cold trailing: A method of mop-up where firefighters feel for heat along the fire edge.

Creeping: Fire spreading slowly with a low flame.

Crowning: Fire spreading through the crowns of trees.

Cup trench: A type of trench constructed on a slope to prevent rolling materials from igniting fuels below.

Finger: A narrow strip of fire extending from the main body of the fire.

Fire Triangle: The three elements required for combustion: fuel, oxygen, and heat.

Fire whirl: A spinning column of fire.

Flaming front: The leading edge of a fire where active flaming combustion is occurring.

Flank: The side of a wildfire, typically divided into right flank and left flank.

Green: An unburned area within the fire perimeter.

Handline: A fireline constructed using hand tools.

Head: The most rapidly spreading part of a wildfire.

Island: An unburned area inside the fire perimeter.

Pyro-cumulus: A cloud formation created by large wildfires.

Rear/Heel: The slowest spreading part of a wildfire, typically opposite the head.

Running: Fire spreading rapidly with a well-defined head.

Spotting: The behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the main fire front.

Swatter: A wildland firefighting hand tool used to put out small flames.

Torching: The sudden ignition and burning of a single tree or a small group of trees.

Wet line: A control line created by wetting fuels with water or retardant.

Supply Chain and Transportation

Automotive

Course Code	Course	Changes
40090000022	ASE Brakes	Simplified, clarified, cleaned up. Updated alignment to current ASE industry task list.
40090000026	ASE Engine MLR	Simplified, clarified, cleaned up. Updated alignment to current ASE industry task list.
40090000025	ASE Engine Performance	Simplified, clarified, cleaned up. Updated alignment to current ASE industry task list.
40090000023	ASE Steering & Suspension	Simplified, clarified, cleaned up. Updated alignment to current ASE industry task list.

Aviation

Course Code	Course	Changes
40110000050	Unmanned Aerial Systems	Name Change to "UAS: Intro to Drones" to provide more description and continuity with other courses. Original content introduced students to drones, flight, and prepared them for the FAA Part 107 certification. We found the amount of content was too much and not appropriate to the grade level. Removed the Part 107 content and focuses more on TRUST and introduction to flying drones to build interest and excitement for the use of drones, while maintaining appropriate grade level content and expectations.
40110000054	UAS Lab: Design, Build, Maintain	Name Change to "UAS: Design and Maintain" to better describe the content covered in the course. Content simplified to be more accessible to the average UAS classroom. More focus on project-based learning.
40110000052	UAS Lab: Intermediate Flight	Name change to "UAS: Remote Pilot" to better describe the content and goal of the course. Original content was heavily focused on mission planning and lacked robust content. This course now includes mission planning and in depth training and preparation for the FAA Part 107 certification. Part 107 certification content is more appropriate for the grade level.
40110000056	UAS Lab: Exploration of Industry Applications	Name change to "UAS: Photo & Video" to better describe the content and goal of the course. The original content of this course explored a broad range of applications: photo/video, photogrammetry, orthomosaic, remote sensing, multispectral, hyperspectral, LiDAR, GIS, and payload delivery. This has shown to

		be too much content to cover and lacked student interest. New content now focuses on the photo and video aspect of flight planning and aerial operations while meeting FAA regulations and explores careers in which these practices can be applied in a wide range of industries.
40110000058	Unmanned Aerial Systems Capstone	Name change to “UAS: Capstone” to mirror and support the rest of the UAS course names. Overhauled the strands and standards to better align to industry projects, including career readiness, deliverables, and FAA safety/compliance.

STRANDS AND STANDARDS

ASE BRAKES

Course Description

This course is designed for students aiming for a career in Automotive Technology. It combines theoretical knowledge and practical skills for diagnosing and repairing various automotive braking systems. Key components include theory and hands-on practice in braking systems, ABS (including traction and stability control), EV regenerative braking systems, and steering and suspension systems. Success requires strong reading, writing, and math skills. Students will participate in hands-on vehicle service activities and must follow all safety regulations. This course is aligned with Automotive Service Excellence (ASE) industry standards.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	40.09.00.00.022
Concurrent Enrollment Core Code	40.09.00.13.022
Prerequisite	Automotive, Intro
Skill Certification Test Number	Industry Exams
Skill Certification Cut Score	**N/A**
Test Weight	N/A
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Automotive Service
Endorsement 2	N/A

Updated: February 2025

STRAND 1: SHOP SAFETY

Students will understand and demonstrate general shop safety.

Standard 1

Learn safe working habits and procedures. Pass relevant safety tests with 100 percent.

- Personal safety.
- Tool and equipment safety.
- Workplace safety.
- Personal protective equipment (PPE).

Standard 2

Comply with safety rules for working with automotive chemicals.

- Chemical manufacturers provide a Safety Data Sheets (SDS) for each chemical they produce.
- Identify the location of and navigate through the SDS for critical information.
- Store and dispose of chemicals in properly labeled containers.

Standard 3

Identify the gasses encountered in the automotive field and the hazards they present.

- Water, oxygen, nitrogen, carbon dioxide (CO2), hydrocarbons (HC), oxides of nitrogen (NOx), and carbon monoxide (CO).
- HC, NOx, and CO can pose health and environmental problems if they are not controlled.

Standard 4

Identify the hazards and control of asbestos dust.

- Asbestos is a carcinogen – a substance that causes cancer.
- Never use compressed air to clean brake assemblies.
- Understand approved methods such as a brake vacuum or brake washer machine.
- Because some exposure might be unavoidable, wear an approved filter mask.

Standard 5

Identify potential electrical safety hazards related to brake systems.

Performance Skills

- Pass relevant safety tests with 100% accuracy.
- Comply with safety rules for working with automotive chemicals.
- Identify the gasses encountered in the automotive field and the hazards they present.
- Identify the hazards and control of asbestos dust.
- Mitigate electrical safety hazards related to brake systems.
- Clean, properly store, and maintain tools, equipment, and workspace.

STRAND 2: BRAKE SYSTEM OPERATIONS

Students will inspect the base brake system.

Standard 1

Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).

Standard 2

Identify brake system components and configurations.

Standard 3

Explore tools and methods for diagnosing brake systems.

- Diagnostic scan tools
- Measuring indicator tools

Standard 4

Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).

Standard 5

Identify and interpret brake system concerns; determine needed action.

Performance Skills

- Using a scan tool, retrieve and record diagnostic trouble codes (DTCs), and freeze frame data; clear codes and data when directed.
- Properly utilize and interpret measuring instrument readings and compare to specifications.

STRAND 3: BRAKE HYDRAULIC SYSTEM

Students will inspect, diagnose, and repair the brake hydraulic system(s).

Standard 1

Identify components of hydraulic brake systems, to include warning light systems.

Standard 2

Inspect, isolate, and diagnose hydraulic brake system failures.

Standard 3

Demonstrate proper procedures for servicing hydraulic systems.

Performance Skills

- Diagnose and service all components of a hydraulic brake system.
- Measure brake pedal height, travel, and free play.
- Inspect brake fluid for proper level and contamination.
- Bleed and/or replace fluid in the brake system.
- Remove, bench bleed, and reinstall the master cylinder.
- Replace brake lines, hoses, fittings, and supports.
- Remove, clean, and install wheel and torque lug nuts to specifications.
- (*optional*) Fabricate brake lines using proper material and flaring procedures.

STRAND 4: DISC BRAKE SYSTEM

Students will inspect, diagnose, and repair the disc brake systems.

Standard 1

Identify components of disc brake systems.

Standard 2

Inspect, isolate, and diagnose disc brake system failures.

Standard 3

Demonstrate proper procedures for servicing disc brake systems.

Standard 4

Summarize the procedures for servicing electric parking brake systems.

Performance Skills

- Perform a burnish/break-in of replacement brake pads.
- Diagnose and service all components of a disc brake system.
- Diagnose potential disc brake system failures.
- Complete a full disc brake system service/repair, including measuring components and comparing to specifications.
- Refinish rotor on vehicle; measure final rotor thickness.
- Refinish rotor off vehicle; measure final rotor thickness.
- Retract and re-adjust caliper piston on an integrated parking brake system.
- Remove, clean, and install wheel and torque lug nuts to specifications.

STRAND 5: DRUM BRAKE SYSTEM

Students will inspect, diagnose, and repair the drum brake system.

Standard 1

Identify components of drum brake systems.

Standard 2

Inspect, isolate, and diagnose drum brake system failures.

Standard 3

Demonstrate proper procedures for servicing drum brake systems.

Performance Skills

- Remove, clean, and inspect brake drum; measure brake drum diameter and taper.
- Diagnose and service all components of a drum brake system.
- Complete a full drum brake system service/repair, including measuring components and comparing to specifications.
- Refinish brake drum and measure final drum.
- Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.
- Remove, clean, and install wheel and torque lug nuts to specifications.

STRAND 6: BRAKE POWER-ASSIST SYSTEM

Students will inspect, diagnose, and repair the brake power-assist system(s).

Standard 1

Identify components of brake power-assist systems (vacuum, hydraulic, electric).

Standard 2

Inspect, isolate, and diagnose brake power-assist system failures.

Standard 3

Demonstrate proper procedures for servicing brake power-assist systems.

Performance Skills

- Diagnose and service all components of a brake power-assist system.
- Complete a full brake power-assist system service/repair, including measuring components and comparing to specifications.
- Remove, clean, and install wheel and torque lug nuts to specifications.

STRAND 7: BRAKE-RELATED SYSTEMS

Students will inspect, diagnose, and repair brake-related system(s).

Standard 1

Identify components of brake-related systems (bearings, parking brake, brake/tail lights, wheel studs, ABS sensors).

Standard 2

Inspect, isolate, and diagnose brake-related system failures.

Standard 3

Demonstrate proper procedures for servicing brake-related systems.

Performance Skills

- Remove, reinstall, and/or replace wheel bearing assemblies.
- Diagnose and service ABS sensors.
- Check operation of brake stop light system.
- Inspect and replace wheel studs.
- Diagnose wheel bearing noises, wheel shimmy, and vibration concerns.
- Diagnose and service all components of break-related systems.
- Complete a full brake-related system service/repair, including measuring components and comparing to specifications.
- Remove, clean, and install wheel and torque lug nuts to specifications.

STRAND 8: ELECTRONIC BRAKE SYSTEM

Students will inspect, diagnose, and repair electronic brake control system(s).

Standard 1

Identify components of electronic brake systems (ABS, traction control system (TCS), electronic stability control (ESC)).

Standard 2

Inspect, isolate, and diagnose electronic brake system failures.

Standard 3

Demonstrate proper procedures for servicing electronic brake systems.

Standard 4

Describe the operation of a regenerative braking system.

Performance Skills

- Bleed the electronic brake control system hydraulic circuits.
- Diagnose and service all components of electronic brake systems.
- Remove, clean, and install wheel and torque lug nuts to specifications.

STRAND 9: DURABLE SKILLS

These standards will not appear on state skill certification exams but should be taught throughout the duration of the course.

Standard 1

Students will display personal skills related to the essential values, personality traits, and personal characteristics for success in automotive repair and life.

- **Integrity** - demonstrate honesty and personal responsibility for actions in repairing and maintaining vehicles.
- **Work ethic** - demonstrate tenacity, hard work, excellence, punctuality, meet deadlines; and be self-directed when completing tasks in the automotive repair classroom or shop.
- **Professionalism** - demonstrate maturity, self-confidence; and a positive image when working with teammates or clients on automotive repair jobs/projects.
- **Responsibility** - demonstrate dependability, consistency, and personal well-being when safely completing automotive repair tasks.
- **Adaptability/Flexibility** - Foster creativity, new ideas, and resilience when working to solve problems in automotive repair tasks.
- **Self-motivated** - demonstrate a willingness to learn, independence, initiative, and a positive attitude when approaching new information

Standard 2

Students will display workplace skills related to the essential attitudes and abilities for success in the automotive repair industry.

- **Communication** – Demonstrates skills in listening and speaking; communicates professionally with teammates, supervisors, and customers in relation to automotive repair.
- **Decision making** – Analyzes key facts, data, and situations to employ reasoning skills for completing automotive repair tasks.
- **Teamwork** – Builds trusting relationships, works cooperatively with others and utilizes individual strengths of team members when completing automotive repair tasks.
- **Planning, organizing, and management** – Designs, prepares, and implements automotive repair tasks within a desired timeframe; Sets priorities and responds to changing priorities.
- **Leadership** – Builds positive relationships and mitigates conflict.

Standard 3

Students will display technical skills that are grounded in automotive repair that deliver essential knowledge and competencies for success in the industry.

- **Computer and technology literacy**
- **Job specific skills**
- **Safety and health**
- **Service orientation** – responds to internal and external customers; demonstrates focus and presence; attends to personal matters away from the classroom.
- **Professional development** – demonstrates openness to learn, grow, and change in the automotive repair industry.

Industry Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		
ASE BRAKES													

KEY VOCABULARY CLARIFICATIONS

ADAS (Advanced Driver Assistance Systems): Systems like lane assist, automatic braking.

Bench Bleed: Bleeding air from a master cylinder outside the vehicle.

Brake Shoe: Component in drum brakes that presses against the drum to create friction.

Brake Burnish or Break-in: Process of conditioning new brake pads to ensure proper performance.

Brake Vacuum: Tool specifically used to safely clean brake dust

Caliper: Device that squeezes brake pads against the rotor.

Diagnostic Scan Tool: Tool used to read vehicle error codes.

DTCs (Diagnostic Trouble Codes): Codes that indicate vehicle issues.

Drum: Cylindrical brake component in drum brake systems.

ESC (Electronic Stability Control): System that helps maintain vehicle control.

Flaring Procedures: Technique for shaping brake lines for fittings.

Free Play: The amount of movement before brake pedal engages

Freeze Frame Data: Snapshot of vehicle conditions when a fault occurred.

Integrated Parking Brake System: Parking brake built into the caliper or electronic system.

PPE (Personal Protective Equipment): Safety gear like gloves, goggles, masks.

Regenerative Braking: System that recaptures energy during braking.

Rotor: Disc that brake pads clamp onto in disc brake systems.

SDS (Safety Data Sheets): Document detailing chemical safety information.

TCS (Traction Control System): Prevents wheel spin during acceleration.

Torque Lug Nuts: Tightening wheel nuts to a specific force using a torque wrench.

Wheel Studs: Bolts that wheels are mounted onto.

STRANDS AND STANDARDS

ASE ENGINE MLR

Learning that works for Utah CTE®

Course Description

This course is part of a series designed to prepare individuals for servicing and maintaining all types of automobiles. It includes training in safety and diagnosing malfunctions in engine maintenance (A1), electrical systems (A6), HVAC (A7), and engine performance (A8). Based on Automotive Service Excellence (ASE) task lists, the course emphasizes work ethics and productivity in both classroom and lab activities.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	40.09.00.00.026
Concurrent Enrollment Core Code	40.09.00.13.026
Prerequisite	Automotive, Intro
Skill Certification Test Number	N/A
Skill Certification Cut Score	**N/A**
Test Weight	N/A
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Automotive Service
Endorsement 2	N/A

STRAND 1: SHOP SAFETY

Students will understand and demonstrate general shop safety.

Standard 1

Learn safe working habits and procedures. Pass relevant safety tests with 100 percent.

- Personal safety.
- Tool and equipment safety.
- Workplace safety.
- Personal protective equipment (PPE).
- Basic first aid procedures

Standard 2

Comply with safety rules and procedures for working with automotive chemicals.

- Chemical manufacturers provide a Safety Data Sheets (SDS) for each chemical they produce.
- Analyze the SDS for critical information.
- Store and dispose of chemicals in properly labeled containers.

Standard 3

Identify the gasses encountered in the automotive field and the hazards they present.

- Water, oxygen, nitrogen, carbon dioxide (CO2), hydrocarbons (HC), oxides of nitrogen (NOx), and carbon monoxide (CO).
- HC, NOx, and CO can pose health and environmental problems if they are not controlled.

Standard 4

Identify the hazards and control of asbestos dust.

- Asbestos is a carcinogen – a substance that causes cancer.
- Never use compressed air to clean brake assemblies.
- Understand approved methods such as a brake vacuum or brake washer machine.
- Because some exposure might be unavoidable, use appropriate PPE for the working condition.

Standard 5

Assess lifting equipment for safe and proper operation.

- Inspect & verify for safe operation.
- Safety devices (swing arms, locks, latches, etc.)
- Lift points (unibody and full frame)
- Jacks and jack stands, auxiliary lift supports
- Two-, Four-Post, and Scissor Lifts.

Standard 6

Identify potential electrical safety hazards.

- Low Voltage Automotive Battery
- EV/Hybrid Vehicles
- Loss of Isolation
- SRS Wires/circuits

Performance Skills

- Pass relevant safety tests with 100 percent.
- Comply with safety rules and procedures for working with automotive chemicals.
- Use concepts and practices to solve, mitigate, and manage potential shop hazards & substances.
- Assess lifting and shop equipment for safe and proper operation.
- Demonstrate safe and proper operation of lifting and shop equipment.
- Comply with safety procedures when working with electrical components and systems (lock out, tag out).
- Mitigate potential electrical safety hazards when working with a vehicle.
- Clean, properly store, and maintain tools, equipment, and workspace.

STRAND 2: ENGINE MAINTENANCE & LIGHT REPAIR

Students will understand, inspect, diagnose, and service the basics of engine repair as detailed in the ASE A1 task list.

Standard 1

Research vehicle service information.

- Fluid type
- Internal combustion
- Engine operation
- Vehicle service history
- Service precautions
- Technical service bulletins
- Recalls including vehicles with advanced driver assist systems (ADAS)

Standard 2

Identify service precautions related to the service of internal combustion engine of a hybrid electric vehicle.

Standard 3

Identify cylinder head and valve train/timing components and configurations.

Standard 4

Identify engine block and lubrication system components and configurations.

Standard 5

Identify cooling system components and configurations and causes of engine overheating.

Performance Skills

- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Verify operation of the instrument panel engine warning indicators.
- Inspect engine assembly for fluid leaks; repair as necessary.
- Inspect and service engine mounts.
- Perform LOF (lube, oil, filter) service.
- Test cooling system for proper operation; repair as necessary.
- Inspect accessory drive system; repair as necessary.

STRAND 3: ELECTRICAL AND SYSTEMS

Students will understand, inspect, diagnose, and service the electrical system as detailed in the ASE A6 task list.

Standard 1
Identify electrical/electronic system components and configurations.

Standard 2
Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).

Standard 3
Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.

Standard 4
Describe electrical test equipment; use appropriate tools to check operation of electrical circuits per service information.

Standard 5
Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting the vehicle battery.

Standard 6
Demonstrate knowledge of an automatic idle-stop/start-stop system.

Standard 7
Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation.

Performance Skills
- Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
- Use fused jumper wires to check operation of electrical circuits per service information.
- Use wiring diagrams to trace electrical/electronic circuits.
- Inspect and test fusible links, circuit breakers, and fuses.
- Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair).
- Perform a battery system service and diagnostics.
- Measure key-off battery drain (parasitic draw).
- Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
- Perform starter system service and diagnostics.
- Perform charging system service and diagnostics.
- Inspect and service interior lighting, exterior lighting, and accessory electrical systems.
- Remove and reinstall door panel.

STRAND 4: HVAC SYSTEM

Students will understand, inspect, diagnose, and service the HVAC system as detailed in the ASE A7 task list.

Standard 1

Identify heating, ventilation, and air conditioning (HVAC) components and configurations.

Standard 2

Identify steps of an A/C performance test.

Standard 3

Identify and interpret HVAC problems.

Standard 4

Show understanding of the need to recover, recycle, and recharge refrigerants using proper equipment and procedures in accordance with local and federal laws.

- Montreal Protocol
- EPA Section 609 Technician Training and Certification

Standard 5

Describe the importance of different A/C systems pertaining to Hybrid and EVs.

Performance Skills

- Inspect A/C system for signs of leaks.
- Inspect for proper A/C condenser airflow.
- Inspect evaporator housing condensation drain.
- Inspect engine cooling and heater systems hoses and pipes.
- Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets.
- Perform proper refrigerant handling and service procedures (i.e. recover, recycle, recharge).

STRAND 5: ENGINE PERFORMANCE

Students will understand, inspect, diagnose, and service the engine performance systems as detailed in the ASE A8 task list.

Standard 1

Demonstrate understanding of proper engine cooling system operation.

Standard 2

Demonstrate understanding of modern camshaft timing.

Standard 3

Demonstrate understanding of computerized control system components and configurations.

Standard 4

Demonstrate understanding of ignition system components and configurations.

Standard 5

Demonstrate understanding of air induction system components and configurations.

Standard 6

Demonstrate understanding of fuel and exhaust systems in regard to emission control.

Performance Skills

- Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.
- Service ignition system as necessary.
- Service fuel systems as necessary.
- Service air induction systems.
- Diagnose and service exhaust systems.
- Diagnose and service positive crankcase ventilation (PCV) and negative crankcase ventilation (NCV) systems.

STRAND 6: DURABLE SKILLS

These standards will not appear on state skill certification exams but should be taught throughout the duration of the course.

Standard 1

Students will display personal skills related to the essential values, personality traits, and personal characteristics for success in automotive repair and life.

- **Integrity** - demonstrate honesty and personal responsibility for actions in repairing and maintaining vehicles.
- **Work ethic** - demonstrate tenacity, hard work, excellence, punctuality, meet deadlines; and be self-directed when completing tasks in the automotive repair classroom or shop.
- **Professionalism** - demonstrate maturity, self-confidence; and a positive image when working with teammates or clients on automotive repair jobs/projects.
- **Responsibility** - demonstrate dependability, consistency, and personal well-being when safely completing automotive repair tasks.
- **Adaptability/Flexibility** - Foster creativity, new ideas, and resilience when working to solve problems in automotive repair tasks.
- **Self-motivated** - demonstrate a willingness to learn, independence, initiative, and a positive attitude when approaching new information

Standard 2

Students will display workplace skills related to the essential attitudes and abilities for success in the automotive repair industry.

- **Communication** – Demonstrates skills in listening and speaking; communicates professionally with teammates, supervisors, and customers in relation to automotive repair.
- **Decision making** – Analyzes key facts, data, and situations to employ reasoning skills for completing automotive repair tasks.
- **Teamwork** – Builds trusting relationships, works cooperatively with others and utilizes individual strengths of team members when completing automotive repair tasks.
- **Planning, organizing, and management** – Designs, prepares, and implements automotive repair tasks within a desired timeframe; Sets priorities and responds to changing priorities.
- **Leadership** – Builds positive relationships and mitigates conflict.

Standard 3

Students will display technical skills that are grounded in automotive repair that deliver essential knowledge and competencies for success in the industry.

- **Computer and technology literacy**
- **Job specific skills**
- **Safety and health**
- **Service orientation** – responds to internal and external customers; demonstrates focus and presence; attends to personal matters away from the classroom.
- **Professional development** – demonstrates openness to learn, grow, and change in the automotive repair industry.

Industry Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		

KEY VOCABULARY CLARIFICATIONS

Air Induction System: System that brings air into the engine for combustion.

Auxiliary Lift Supports: Additional supports used during lifting for safety.

Brake Vacuum: Tool used to safely clean brake dust.

Camshaft Timing: Controls when engine valves open and close.

Crankcase Ventilation (PCV/NCV): Systems that manage engine gases to reduce emissions.

DTCs (Diagnostic Trouble Codes): Codes that indicate specific vehicle issues.

EPA Section 609: U.S. certification for handling automotive refrigerants.

Freeze Frame Data: Snapshot of vehicle conditions when a fault occurred.

Fused Jumper Wires: Wires with built-in fuses used for safe circuit testing.

HVAC: Heating, ventilation, and air conditioning in vehicles.

Idle-Stop/Start-Stop System: System that turns off the engine at stops to save fuel.

Jack Stands: Safety devices used to support a lifted vehicle.

Lift Points: Specific locations on a vehicle where it is safe to lift using a hoist or jack.

Lock Out, Tag Out: Safety procedure to ensure equipment is off before servicing.

LOF (Lube, Oil, Filter): Routine maintenance involving oil change and filter replacement.

Loss of Isolation: Electrical hazard where high-voltage systems lose insulation or separation from the chassis.

Montreal Protocol: International treaty to protect the ozone layer by phasing out harmful refrigerants.

OBD (On-Board Diagnostics): Specific procedures for handling A/C chemicals safely.

Parasitic Draw: Electrical drain from the battery when the vehicle is off.

PPE (Personal Protective Equipment): Safety gear like gloves, goggles, and masks.

Refrigerant Recovery/Recycle/Recharge: Specific procedures for handling A/C chemicals safely.

Scissor Lift: A type of automotive lift that raises vehicles vertically using a scissor mechanism.

SDS (Safety Data Sheet): Document that provides safety info about chemicals.

SRS (Supplemental Restraint System): Airbag system in vehicles.

Swing Arms: Part of a lift that supports the vehicle during elevation.

Timing Components: Parts that control the timing of engine valve operation.

Unibody vs. Full Frame: Types of vehicle construction affecting lift points and repair methods.

Valve Train: Engine components that control the opening/closing of valves.

STRANDS AND STANDARDS

ASE ENGINE PERFORMANCE

Learning that works for Utah CTE®

Course Description

This course prepares students for the ASE Engine Performance certification exam by teaching them about modern engine systems, including theory, diagnosis, and repair. Students will learn about internal combustion engines, control systems, fuel delivery, ignition, and emission control. They will also gain skills in using diagnostic tools, interpreting trouble codes, and troubleshooting engine issues. The course covers engine tune-ups, sensor replacements, and repairs of fuel, ignition, and emission systems. Essential skills include reading technical manuals, writing reports, applied technical math, and effective communication. By the end, students will be proficient in diagnosing and repairing engine performance issues, ready for a career in the automotive industry.

Intended Grade Level	11-12
Units of Credit	0.5
Core Code	40.09.00.00.025
Concurrent Enrollment Core Code	40.09.00.13.025
Prerequisite	Automotive, Intro
Skill Certification Test Number	N/A
Skill Certification Cut Score	**N/A**
Test Weight	N/A
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Automotive Service
Endorsement 2	N/A

Updated: April 2025

STRAND 1: SHOP SAFETY

Students will understand and demonstrate general shop safety.

Standard 1

Learn safe working habits and procedures. Pass relevant safety tests with 100 percent.

- Personal safety.
- Tool and equipment safety.
- Workplace safety.
- Personal protective equipment (PPE).
- Basic first aid procedures

Standard 2

Comply with safety rules and procedures for working with automotive chemicals.

- Chemical manufacturers provide a Safety Data Sheets (SDS) for each chemical they produce.
- Analyze the SDS for critical information.
- Store and dispose of chemicals in properly labeled containers.

Standard 3

Identify the gasses encountered in the automotive field and the hazards they present.

- Water, oxygen, nitrogen, carbon dioxide (CO2), hydrocarbons (HC), oxides of nitrogen (NOx), and carbon monoxide (CO).
- HC, NOx, and CO can pose health and environmental problems if they are not controlled.

Standard 4

Identify the hazards and control of asbestos dust.

- Asbestos is a carcinogen – a substance that causes cancer.
- Never use compressed air to clean brake assemblies.
- Understand approved methods such as a brake vacuum or brake washer machine.
- Because some exposure might be unavoidable, use appropriate PPE for the working condition.

Standard 5

Assess lifting equipment for safe and proper operation.

- Inspect & verify for safe operation.
- Safety devices (swing arms, locks, latches, etc.)
- Lift points (unibody and full frame)
- Jacks and jack stands, auxiliary lift supports
- Two-, Four-Post, and Scissor Lifts.

Standard 6

Identify potential electrical safety hazards.

- Low Voltage Automotive Battery
- EV/Hybrid Vehicles
- Loss of Isolation
- SRS Wires/circuits

Performance Skills

- Pass relevant safety tests with 100 percent.
- Comply with safety rules and procedures for working with automotive chemicals.
- Use concepts and practices to solve, mitigate, and manage potential shop hazards & substances.
- Assess lifting and shop equipment for safe and proper operation.
- Demonstrate safe and proper operation of lifting and shop equipment.
- Comply with safety procedures when working with electrical components and systems (lock out, tag out).
- Mitigate potential electrical safety hazards when working with a vehicle.
- Clean, properly store, and maintain tools, equipment, and workspace.

STRAND 2: ENGINE PERFORMANCE SYSTEMS

Students will inspect engine performance systems.

Standard 1

Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).

Standard 2

Verify proper engine cooling system operation.

Standard 3

Diagnose engine mechanical concerns, including correct camshaft timing.

Standard 4

Identify diagnostic procedures and tools for abnormal engine noises or vibration concerns.

Standard 5

Identify the causes of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound.

Standard 6

Analyze case studies and real-world scenarios related to engine performance systems.

- Engine design
- Fuel quality & type
- Air intake & exhaust systems
- Mechanical Integrity (pistons, crankshaft, camshaft, valves, etc.)
- Environmental conditions (temperature & altitude)
- Technological advancements (direct fuel injection, variable valve timing, electronic control units (ECUs), etc.)

Performance Skills

- Interpret Diagnostic Trouble Codes (DTCs), readiness monitor status (including open/closed loop status), and freeze frame data; clear codes and data when directed.
- Perform engine manifold pressure tests (vacuum/boost).
- Perform cylinder power balance, cranking and running compression, and leakage tests.
- Troubleshoot engine performance issues (oil, coolant, exhaust, timing, ignition, fuel delivery, etc.)

STRAND 3: COMPUTERIZED CONTROLS

Students will inspect computerized controls.

Standard 1

Identify computerized control system components and configurations.

Standard 2

Describe the use of readiness monitors for repair verification.

Standard 3

Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM).

Performance Skills

- Access and use service information to perform step-by-step (troubleshooting) diagnosis.
- Perform active tests of actuators using a scan tool
- Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM), digital storage oscilloscope (DSO), and/or scan tool.

STRAND 4: IGNITION SYSTEM

Students will inspect the ignition system.

Standard 1

Identify ignition system components and configurations.

Standard 2

Analyze ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns.

Performance Skills

- Diagnose and repair ignition system related problems.
- Remove and replace spark plugs; inspect secondary ignition components for wear and damage.
- Inspect and test crankshaft and camshaft position sensor(s).
- Inspect, test, and/or replace ignition control module and/or powertrain/engine control module; reprogram/initialize as needed.

STRAND 5: FUEL, AIR INDUCTION, AND EXHAUST SYSTEMS

Students will inspect the fuel, air induction, and exhaust systems.

Standard 1

Identify fuel, air induction, and exhaust system components and configurations.

Standard 2

Analyze fuel for quality, composition, additives (diesel exhaust fluid (DEF)), contamination, and efficiencies related to engine performance.

Standard 3

Analyze theories of operation of fuel systems.

Standard 4

Analyze exhaust system for proper operation and performance.

Performance Skills

- Inspect, service, or replace air and fuel filters, filter housings, and intake duct work.
- Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), hangers, brackets, clamps, and heat shields.
- Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume.
- Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air; verify proper idle speed.
- Inspect, test, and/or replace fuel injectors on low- and high-pressure systems.
- Perform exhaust system back-pressure test.
- (optional) Check fuel for quality, composition, and contamination; determine needed action.

STRAND 6: EMISSION CONTROL SYSTEMS

Students will inspect emission control systems.

Standard 1

Identify, analyze, and interpret diagnostic procedures and codes on oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system and effects on emissions.

Standard 2

Identify, analyze, and interpret diagnostic procedures and codes on emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system.

Standard 3

Identify, analyze, and interpret diagnostic procedures and codes on emissions and drivability concerns caused by catalytic converter systems.

Standard 4

Identify, analyze, and interpret diagnostic procedures and codes for emissions and drivability concerns caused by the evaporative emissions control (EVAP) system.

Performance Skills

- Inspect, test, and service emission control systems (PCV, EGR, catalytic converter, EVAP, air pump).
- Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.

STRAND 7: DURABLE SKILLS

These standards will not appear on state skill certification exams but should be taught throughout the duration of the course.

Standard 1

Students will display personal skills related to the essential values, personality traits, and personal characteristics for success in automotive repair and life.

- **Integrity** - demonstrate honesty and personal responsibility for actions in repairing and maintaining vehicles.
- **Work ethic** - demonstrate tenacity, hard work, excellence, punctuality, meet deadlines; and be self-directed when completing tasks in the automotive repair classroom or shop.
- **Professionalism** - demonstrate maturity, self-confidence; and a positive image when working with teammates or clients on automotive repair jobs/projects.
- **Responsibility** - demonstrate dependability, consistency, and personal well-being when safely completing automotive repair tasks.
- **Adaptability/Flexibility** - Foster creativity, new ideas, and resilience when working to solve problems in automotive repair tasks.
- **Self-motivated** - demonstrate a willingness to learn, independence, initiative, and a positive attitude when approaching new information

Standard 2

Students will display workplace skills related to the essential attitudes and abilities for success in the automotive repair industry.

- **Communication** – Demonstrates skills in listening and speaking; communicates professionally with teammates, supervisors, and customers in relation to automotive repair.
- **Decision making** – Analyzes key facts, data, and situations to employ reasoning skills for completing automotive repair tasks.
- **Teamwork** – Builds trusting relationships, works cooperatively with others and utilizes individual strengths of team members when completing automotive repair tasks.
- **Planning, organizing, and management** – Designs, prepares, and implements automotive repair tasks within a desired timeframe; Sets priorities and responds to changing priorities.
- **Leadership** – Builds positive relationships and mitigates conflict.

Standard 3

Students will display technical skills that are grounded in automotive repair that deliver essential knowledge and competencies for success in the industry.

- **Computer and technology literacy**
- **Job specific skills**
- **Safety and health**
- **Service orientation** – responds to internal and external customers; demonstrates focus and presence; attends to personal matters away from the classroom.
- **Professional development** – demonstrates openness to learn, grow, and change in the automotive repair industry.

Industry Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		

KEY VOCABULARY CLARIFICATIONS

ADAS (Advanced Driver Assistance Systems): Safety systems like lane-keeping, adaptive cruise control, etc.

Air induction system: Brings air into the engine for combustion.

Auxiliary lift supports: Additional supports used during vehicle lifting.

Back-pressure test: Measures resistance in the exhaust system to check for blockages.

Camshaft timing: Controls when engine valves open and close.

Catalytic converter: Reduces harmful emissions in the exhaust system.

Crankcase ventilation (PCV/NCV): Systems that manage engine gases to reduce emissions.

Crankshaft position sensor: Detects crankshaft position to help control ignition and fuel injection.

DEF (Diesel Exhaust Fluid): Additive used in diesel engines to reduce emissions.

Digital storage oscilloscope (DSO): Tool used to visualize electrical waveforms.

DTCs (Diagnostic Trouble Codes): Codes that indicate specific vehicle issues.

EGR (Exhaust Gas Recirculation): System that recirculates exhaust gases to reduce emissions.

ECU (Electronic Control Unit): Computer that controls engine and other systems.

Electronic control systems: Systems that manage engine performance electronically.

Engine manifold pressure test: Measures air pressure in the intake manifold.

Evaporative emissions control (EVAP) system: Prevents fuel vapors from escaping into the atmosphere.

Exhaust manifold: Collects exhaust gases from the engine cylinders.

Exhaust resonator: Modifies exhaust sound.

Freeze frame data: Snapshot of vehicle conditions when a fault occurred.

Fused jumper wires: Wires with built-in fuses used for safe circuit testing.

Fuel injectors: Spray fuel into the engine's combustion chamber.

Fuel quality/composition: Refers to the type and cleanliness of fuel used.

GMM (Graphing Multimeter): Displays electrical signals graphically.

Heat shield: Protects vehicle parts from exhaust heat.

Idle-stop/start-stop system: Turns off the engine at stops to save fuel.

Ignition control module: Controls spark timing in the ignition system.

Ignition system: System that ignites the air-fuel mixture in the engine.

Lift points: Specific locations on a vehicle where it is safe to lift.

Lock out, tag out: Safety procedure to ensure equipment is off before servicing.

Loss of isolation: Electrical hazard in high-voltage systems.

Manifold: Part of the engine that distributes air or collects exhaust gases.

Montreal Protocol: International treaty to phase out ozone-depleting substances.

NCV (Negative Crankcase Ventilation): Less common term related to crankcase ventilation.

OBD (On-Board Diagnostics): System that monitors vehicle performance and emissions.

Open/closed loop status: Refers to how the engine control system is managing fuel delivery.

Parasitic draw: Electrical drain from the battery when the vehicle is off.

PPE (Personal Protective Equipment): Safety gear like gloves, goggles, and masks.

Powertrain/engine control module (PCM/ECM): Computer that manages engine and transmission.

Readiness monitor status: Indicates whether vehicle systems have completed self-tests.

Resonator: Part of the exhaust system that modifies sound.

Scan tool: Device used to read vehicle diagnostic data.

Scissor lift: A type of automotive lift that raises vehicles vertically.

SDS (Safety Data Sheet): Document that provides safety info about chemicals.

Secondary ignition components: Parts like spark plug wires and ignition coils.

Spark knock: Unwanted combustion causing engine noise and damage.

Spark plugs: Ignite the air-fuel mixture in the engine.

SRS (Supplemental Restraint System): Airbag system in vehicles.

Swing arms: Part of a lift that supports the vehicle during elevation.

Throttle body: Controls air intake into the engine.

Unibody vs. full frame: Types of vehicle construction.

Vacuum leaks: Unintended air entering the engine, affecting performance.

STRANDS AND STANDARDS

ASE STEERING & SUSPENSION

Learning that works for Utah CTE®

Course Description

This course covers the fundamentals of automotive steering and suspension systems, designed for aspiring automotive technicians. Students will learn about tire types and wear patterns, different suspension systems, and various steering technologies. The course also includes vehicle alignment procedures, principles of steering and suspension dynamics, and techniques for diagnosing and repairing common issues. Students will be able to identify key components, perform accurate diagnoses and repairs, and conduct thorough vehicle alignments. Proficiency in reading technical manuals, writing reports, and applying mathematical concepts is essential for success.

Intended Grade Level	11-12
Units of Credit	0.5
Core Code	40.09.00.00.023
Concurrent Enrollment Core Code	40.09.00.13.023
Prerequisite	Automotive, Intro
Skill Certification Test Number	956
Skill Certification Cut Score	**N/A**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Automotive Service
Endorsement 2	N/A

STRAND 1: SHOP SAFETY

Students will understand and demonstrate general shop safety.

Standard 1

Learn safe working habits and procedures. Pass relevant safety tests with 100 percent.

- Personal safety.
- Tool and equipment safety.
- Workplace safety.
- Personal protective equipment (PPE).
- Basic first aid procedures

Standard 2

Comply with safety rules and procedures for working with automotive chemicals.

- Chemical manufacturers provide a Safety Data Sheets (SDS) for each chemical they produce.
- Analyze the SDS for critical information.
- Store and dispose of chemicals in properly labeled containers.

Standard 3

Identify the gasses encountered in the automotive field and the hazards they present.

- Water, oxygen, nitrogen, carbon dioxide (CO2), hydrocarbons (HC), oxides of nitrogen (NOx), and carbon monoxide (CO).
- HC, NOx, and CO can pose health and environmental problems if they are not controlled.

Standard 4

Identify the hazards and control of asbestos dust.

- Asbestos is a carcinogen – a substance that causes cancer.
- Never use compressed air to clean brake assemblies.
- Understand approved methods such as a brake vacuum or brake washer machine.
- Because some exposure might be unavoidable, use appropriate PPE for the working condition.

Standard 5

Assess lifting equipment for safe and proper operation.

- Inspect & verify for safe operation.
- Safety devices (swing arms, locks, latches, etc.)
- Lift points (unibody and full frame)
- Jacks and jack stands, auxiliary lift supports
- Two-, Four-Post, and Scissor Lifts.

Standard 6

Identify potential electrical safety hazards.

- Low Voltage Automotive Battery
- EV/Hybrid Vehicles
- Loss of Isolation
- SRS Wires/circuits

Performance Skills

- Pass relevant safety tests with 100 percent.
- Comply with safety rules and procedures for working with automotive chemicals.
- Use concepts and practices to solve, mitigate, and manage potential shop hazards & substances.
- Assess lifting and shop equipment for safe and proper operation.
- Demonstrate safe and proper operation of lifting and shop equipment.
- Comply with safety procedures when working with electrical components and systems (lock out, tag out).
- Mitigate potential electrical safety hazards when working with a vehicle.
- Clean, properly store, and maintain tools, equipment, and workspace.

STRAND 2: WHEELS, TIRES, & HUBS

Students will be able to understand, identify, and properly diagnose and repair wheels and tires.

Standard 1

Assess and discuss tire construction and defects.

Standard 2

Identify and discuss causes of unusual tire wear patterns.

Standard 3

Discuss theories of wheel and tire vibration (shimmy and tramp) as related to balancing procedures.

Standard 4

Differentiate wheel constructions, offsets, and lugnut designs.

Standard 5

Compare and discuss tapered and non-servicable wheel bearings.

Standard 6

Identify and discuss indirect and direct tire pressure monitoring systems (TPMS), including calibrate/relearn.

Performance Skill

- Diagnose unusual tire wear patterns; determine needed repairs.
- Diagnose tire pull (lead) and vibration problems; determine corrective actions.
- Inspect and service wheels and tires (mount/dismount, balance, flat repair).
- Measure and diagnose possible wheel problems; determine needed repairs.
- Rotate tires according to manufacturer's recommendations.
- Reinstall wheel; torque lug nuts to manufacturer's specifications.
- Remove, inspect, and service or replace wheel bearings.
- Inspect and service TPMS.

STRAND 3: SUSPENSION SYSTEMS

Students will be able to properly identify, diagnose, service, and repair suspension systems.

Standard 1

Identify and name all components of a suspension system.

Standard 2

Compare and discuss the various styles of suspension systems and their configurations, including electronically adjusted.

Standard 3

Differentiate uneven ride height problems (lifting and lowering of vehicles).

Standard 4

Investigate the configuration and function of shocks and struts.

Performance Skill

- Diagnose and service all suspension components (ball joint, bushings, spring and shock condition, etc.).
- Diagnose and service suspension system noises, body sway, and uneven ride height.
- Remove and replace suspension components (shocks, struts, springs, sway bar links, bushings, etc.)
- Lubricate suspension components.

STRAND 4: STEERING SYSTEMS

Students will be able to identify, and properly diagnose and repair steering systems.

Standard 1

Discuss safety procedures when working with Supplemental Restraint System (SRS).

Standard 2

Identify and name all components of a steering system.

Standard 3

Compare and discuss the various styles of steering systems and their configurations.

Standard 4

Investigate the configuration and function of various power assist systems.

Performance Skill

- Disable and enable Supplemental Restraint System (SRS) in accordance with manufacturer's procedures.
- Diagnose and service all steering components, rack and pinion, and linkage systems.
- Diagnose and service steering system noises, binding, play, etc.
- Remove, inspect, and replace steering system components.
- Lubricate steering components.
- Inspect and service power steering system, fluid levels, leaks, and condition.
- Inspect, adjust, or replace the power steering pump belt.
- Diagnose and inspect related components of electronically controlled steering systems.

STRAND 5: WHEEL ALIGNMENT

Students will be able to understand, identify, and properly diagnose, adjust, and repair wheel alignment.

Standard 1

Identify and assess the effect of various alignment angles (camber, caster, toe, steering axis inclination (SAI), king pin inclination (KPI), thrust angle, etc.).

Standard 2

Identify and discuss vehicle driveability problems (wandering, pulling, hard steering, and poor steering return).

Standard 3

Describe the procedures for proper use of alignment equipment.

Standard 4

Discuss Advanced Driver-Assistance Systems (ADAS).

Performance Skill

- Complete a pre-alignment check, including ADAS when applicable.
- Complete a full alignment according to factory specifications.
- Reset a steering angle sensor.
- Clean and maintain an alignment rack.

STRAND 6: DURABLE SKILLS

These standards will not appear on state skill certification exams but should be taught throughout the duration of the course.

Standard 1

Students will display personal skills related to the essential values, personality traits, and personal characteristics for success in automotive repair and life.

- **Integrity** - demonstrate honesty and personal responsibility for actions in repairing and maintaining vehicles.
- **Work ethic** - demonstrate tenacity, hard work, excellence, punctuality, meet deadlines; and be self-directed when completing tasks in the automotive repair classroom or shop.
- **Professionalism** - demonstrate maturity, self-confidence; and a positive image when working with teammates or clients on automotive repair jobs/projects.
- **Responsibility** - demonstrate dependability, consistency, and personal well-being when safely completing automotive repair tasks.
- **Adaptability/Flexibility** - Foster creativity, new ideas, and resilience when working to solve problems in automotive repair tasks.
- **Self-motivated** - demonstrate a willingness to learn, independence, initiative, and a positive attitude when approaching new information

Standard 2

Students will display workplace skills related to the essential attitudes and abilities for success in the automotive repair industry.

- **Communication** – Demonstrates skills in listening and speaking; communicates professionally with teammates, supervisors, and customers in relation to automotive repair.
- **Decision making** – Analyzes key facts, data, and situations to employ reasoning skills for completing automotive repair tasks.
- **Teamwork** – Builds trusting relationships, works cooperatively with others and utilizes individual strengths of team members when completing automotive repair tasks.
- **Planning, organizing, and management** – Designs, prepares, and implements automotive repair tasks within a desired timeframe; Sets priorities and responds to changing priorities.
- **Leadership** – Builds positive relationships and mitigates conflict.

Standard 3

Students will display technical skills that are grounded in automotive repair that deliver essential knowledge and competencies for success in the industry.

- **Computer and technology literacy**
- **Job specific skills**
- **Safety and health**
- **Service orientation** – responds to internal and external customers; demonstrates focus and presence; attends to personal matters away from the classroom.
- **Professional development** – demonstrates openness to learn, grow, and change in the automotive repair industry.

Industry Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		

KEY VOCABULARY CLARIFICATIONS

ADAS (Advanced Driver-Assistance Systems): Vehicle safety systems like lane-keeping and adaptive cruise control.

Alignment angles: Measurements (camber, caster, toe, etc.) that affect how a vehicle tracks and handles.

Auxiliary lift supports: Additional devices used to stabilize a lifted vehicle.

Balance (tires): Process of equalizing weight distribution around a tire and wheel assembly.

Ball joint: A pivot point in the suspension system allowing movement in multiple directions.

Basic first aid procedures: Immediate care techniques for injuries before professional help arrives.

Brake vacuum/washer machine: Specific tools used to safely clean brake dust without releasing harmful particles.

Bushings: Rubber or polyurethane components that cushion joints in suspension and steering systems.

Camber: Alignment angle that affects tire wear and vehicle stability.

Caster: Alignment angle that affects steering stability and return.

Chemical disposal: Proper method for discarding hazardous automotive chemicals.

Driveability problems: Issues like pulling, wandering, or hard steering that affect vehicle control.

Flat repair: Fixing a punctured or damaged tire.

Four-post lift: A type of vehicle lift supported by four columns.

Indirect TPMS: Tire pressure monitoring system that uses wheel speed sensors to estimate pressure.

Jack stands: Safety devices used to support a lifted vehicle.

Jacks: Tools used to lift a vehicle off the ground.

KPI (King Pin Inclination): Alignment angle affecting steering geometry.

Lift points: Specific locations on a vehicle where it is safe to lift.

Locks and latches: Safety mechanisms on lifting equipment.

Loss of isolation: Electrical hazard in high-voltage systems where insulation fails.

Lug nut: Fastener used to secure a wheel to a vehicle.

Mount/dismount (tires): Installing or removing tires from wheels.

Offset (wheel): The distance from the wheel's mounting surface to its centerline.

Personal protective equipment (PPE): Safety gear like gloves, goggles, and masks.

Play (steering): Excess movement in the steering system before the wheels respond.

Power assist systems: Systems that reduce the effort needed to steer a vehicle.

Power steering pump belt: Belt that drives the power steering pump.

Pull (lead): A condition where a vehicle drifts to one side while driving.

Rack and pinion: A type of steering mechanism that converts rotational motion into linear motion.

Ride height: The distance between the vehicle's body and the ground.

SAI (Steering Axis Inclination): Alignment angle affecting steering return and stability.

Safety Data Sheet (SDS): Document that provides safety info about chemicals.

Scissor lift: A type of automotive lift that raises vehicles vertically.

Spring: Suspension component that absorbs road shocks.

SRS (Supplemental Restraint System): Airbag system in vehicles.

Steering angle sensor: Sensor that detects the position of the steering wheel.

Strut: Suspension component that combines a shock absorber and a spring.

Suspension system: System of springs, shocks, and linkages that connect a vehicle to its wheels.

Swing arms: Part of a lift that supports the vehicle during elevation.

Tapered wheel bearings: Bearings designed to handle both radial and axial loads.

Thrust angle: Alignment angle that affects rear wheel tracking.

Toe: Alignment angle that affects tire wear and vehicle tracking.

Torque lug nuts: Tightening wheel nuts to a specific force using a torque wrench.

TPMS (Tire Pressure Monitoring System): System that alerts the driver to under-inflated tires.

Tramp: Vertical bouncing motion of a wheel.

Two-post lift: A type of vehicle lift supported by two columns.

Unibody: Vehicle construction where the body and frame are a single unit.

Unusual tire wear patterns: Irregular tread wear that may indicate alignment or suspension issues.

Wheel alignment: Adjusting the angles of wheels to manufacturer specifications.

Wheel bearing: Component that allows wheels to rotate smoothly.

Wheel construction: Design and material of a wheel.

Wheel hub: Central part of the wheel that connects to the axle.

Wheel offset: Position of the wheel mounting surface relative to the centerline.

Wheel shimmy: Side-to-side vibration of the wheels.

STRANDS AND STANDARDS

UAS: INTRO TO DRONES

Learning that works for Utah
CTE®

Course Description

This course introduces students to various aspects of drones including: rules and regulations, flight logs, flight operations, flight skills, equipment maintenance, and industry pathways.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	40.11.00.00.050
Concurrent Enrollment Core Code	40.11.00.13.050
Prerequisite	N/A
Skill Certification Test Number	670
Skill Certification Cut Score	**60%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Aviation - Flight
Endorsement 2	Unmanned Aircraft Systems (UAS)

Updated: September 2024

STRAND 1: RULES & REGULATIONS

Recognize Federal Aviation Administration (FAA) recreational pilot privileges and limitations as outlined in the Exception for Recreational Flyers.

Standard 1

Recall FAA recreational flying requirements of The Recreational UAS Safety Test (TRUST) including but not limited to:

- General
- FAA-recognized Community Based Organization (CBO)
- Visual line of sight
- Use of a visual observer (VO) co-located and in direct communication with the pilot
- Give way and do not interfere with other aircraft
- Fly at or below FAA-authorized altitudes in controlled airspace only with prior authorization
- Fly at or below 400 feet in Class G airspace
- Low Altitude Authorization and Notification Capability (LAANC)
- DroneZone
- B4UFLY
- Drone registration
- Remote Identification
- Do not operate your drone in a manner that endangers the safety of the National Airspace System (NAS)
- Remain current on TRUST regulations per annual updates

Standard 2

Understand the pilot's responsibility to the UAS community.

Performance Skills

- Earn an FAA TRUST certificate for recreational flyers.
- Have an FAA TRUST certificate accessible while operating UAS.
- Demonstrate recreational flying requirements in accordance with FAA regulations.

STRAND 2: FLIGHT LOGS

Students will utilize a flight log as related to aviation standards and industry expectations.

Standard 1

Identify the purpose of flight log books.

- Tracking Pilot Progress and Performance
- Investigating Accidents and Incidents
- Improving Operational Efficiency
- Ensuring Data Accuracy and Security

Standard 2

Demonstrate logging flight as related to aviation standards and industry expectations.

Standard 3

Identify elements of a basic flight log.

- Date
- Aircraft type (including FAA registration number)
- Pilot Name
- Flight time (in 10ths)
- Post-flight observations/roles
- Location

Performance Skills

- Demonstrate accountability by accurately logging drone flight data.
- Show flight experience through logging flight data from multiple flights.

STRAND 3: FLIGHT OPERATIONS

Students will use aviation checklists for safety throughout all phases of flight operations, including pre, during, and post-flight.

Standard 1

Summarize the importance of a preflight checklist as related to aviation and industry standards.

- Pilot, Aircraft, Environment, External pressures (PAVE)
  - Illness, Medication, Stress, Alcohol, Fatigue, Eating/Emotion (IMSAFE)
  - Manufacturer's guidelines
  - Weather minimums
  - Risk assessment
    - Emergency procedures
    - Preflight safety meeting

Standard 2

Summarize the importance of an inflight checklist as related to aviation and industry standards.

- FAA TRUST regulations and operating limitations
  - CBO guideline compliance
- Situational Awareness
  - Battery levels
  - Visual line of sight (VLOS)
  - Changing weather conditions
  - Collision avoidance

Standard 3

Summarize the importance of a post-flight checklist as related to aviation and industry standards.

- Drone and equipment condition
- Manufacturer's guidelines for storage and repairs
- Flight logs completed

Performance Skills

- Based on aviation checklists, make informed and safe decisions throughout all phases of flight.
- Lead a preflight safety briefing.

STRAND 4: FLIGHT SKILLS

Students will recognize and show proficiency in introductory, advanced, and communication skills related to flight in relation to manual flight and aviation industry standards.

Standard 1

Recognize the purpose and application of basic flight maneuvers.

- Basic flight controls
- Squares
- Circles
- Parallel searches

Standard 2

Recognize the purpose and application of introductory flight skills.

- Manual control
- Obstacle avoidance
- Payload utilization

Standard 3

Recognize the purpose and application of advanced flight skills.

- Patterns
  - Search and rescue
  - Grid
- First Person View (FPV)
- Fixed Wing Control
- Vertical Take-off and Landing (VTOL)
- Autonomous missions

Standard 4

Relate the importance of appropriate communication skills to aviation standards.

- Team coordination
- Aviation terminology

Performance Skills

- Demonstrate effective communication while performing flight skills as part of a team.
- Safely and successfully demonstrate a minimum of three basic maneuvers.
- Safely and successfully demonstrate at least one advanced flight skill.

STRAND 5: EQUIPMENT MAINTENANCE

Students will recognize UAS-related maintenance concepts and show the importance of maintenance practices related to drones.

Standard 1

Identify the location of UAS components and their functions.

- Airframe
- Landing surface/gear
- Propellers
- Motors
- Propeller guard
- Battery
- Transmitter (and phone/tablet)
- Receiver

Standard 2

Illustrate the effect regular maintenance has on aircraft performance over time.

- Firmware (drone)
- Software (app)
- Propeller replacement
- Calibration
- Component checks
- Battery

Standard 3

Explain battery disposal in terms of global awareness.

Performance Skills

- Identify damaged UAS components.
- Replace basic components (propellers, propeller guards, battery, etc.).
- Perform a pre- and post-flight inspection.
- Demonstrate safe LiPo battery practices (charging/discharging, replacing, and storage).

STRAND 6: INDUSTRY

Students will explore how Unmanned Aircraft Systems are used in the real world and what qualifications must be met for related careers.

Standard 1

Explore careers in Unmanned Aircraft Systems.

- Drone Pilot
  - Commercial
  - survey/mapping
- UAS Technician
  - Maintenance
  - Deployment
- Data analyst
- Software developer
- Regulatory specialist

Standard 2

Investigate industry opportunities in Unmanned Aircraft Systems related to student interests.

- Aviation
- Agriculture
- Construction and infrastructure
- Public safety
- Environmental monitoring
- Media & entertainment
- Logistics & delivery

Standard 3

Identify the requirements for UAS operations careers.

- Logbook
- Resume
- Portfolio
- Certification

Performance Skills

- Present a personalized UAS post-secondary plan (college or career).

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		
UAS: INTRO TO DRONES	670							-	-	-	-		

STRANDS AND STANDARDS

UAS: DESIGN AND MAINTAIN

Learning that works for Utah
CTE®

Course Description

This course explores aviation principles while designing and testing a drone. It combines engineering processes and aviation principles into a hands-on course specifically created for the exploration of Unmanned Aircraft Systems in a variety of industries.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	40.11.00.00.054
Concurrent Enrollment Core Code	40.11.00.13.054
Prerequisite	Unmanned Aircraft Systems (UAS)
Skill Certification Test Number	672
Skill Certification Cut Score	**80%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Aviation - Flight
Endorsement 2	Unmanned Aircraft Systems

Updated: October 2024

STRAND 1: CONSTRUCTION TECHNIQUES

Students will understand drone construction techniques including safety techniques, tools identification, material usage, and soldering skills.

Standard 1

Identify tools/equipment and their uses.

- Drivers & screws (philips, flathead, robertson, torque, hex)
- Soldering iron and solder
- Needle-nose pliers
- Wire strippers
- Wrenches (adjustable, crescent)
- Heat gun
- Multimeter
- Hot glue gun
- Blades
- Measuring devices (calipers, ruler)

Standard 2

Distinguish the difference and convert between metric and imperial units of measurement.

Standard 3

Identify UAS materials, their uses, and their unique construction and repair techniques (foamboard, carbon fiber, fiberglass, composites, etc.)

Standard 4

Identify soldering techniques and safety skills as applied to drones.

- Tinning
- Splicing
- Applications (jumper wires, battery connectors, Printed Circuit Boards (PCBs), header pins, bullet connectors)
- Heat shrink
- Positive, negative, and signal wiring and colors related to solder connections
- Clean, industry-standard solder

Performance Skills

- Demonstrate proper tool safety by following Standard Operating Procedures.
- Safely construct an object using basic construction materials (foamboard, molded plastic, 3D print, composites, etc.).
- Solder and test a simple circuit.
- Demonstrate a clean and safe solder with multiple gauge wires.
- Demonstrate a clean and safe solder to a battery connector.
- Make a measurement to millimeter accuracy using a measuring tool.
- Pass relevant safety tests with 100% accuracy.

STRAND 2: COMPONENTS AND AERODYNAMICS

Students will gain an understanding of the basic components for UAS and what terminology is used in the field. Students will also understand how these components help facilitate aerodynamic principles for all kinds of UAS.

Standard 1

Identify basic UAS components and their uses.

- Servo (leads, arms)
- Control horn and control rod
- Flight controller
  - Battery Eliminator Circuit (BEC)
- Motor (brushed, brushless)
- Electronic Speed Control (ESC)
- Propeller
- Battery (charging, conversion, connectors)
- Sensors/payloads (VTX, camera, LIDAR, GPS, etc.)
- Frames (types, shapes, materials, landing gear)

Standard 2

Match motors, batteries, ESCs, and propellers for a functioning UAS considering factors such as current limits, connector types, and part sizes.

Standard 3

Identify aerodynamic principles in multiple types of UAVs.

- Four forces of flight (lift, drag, thrust, weight)
  - Loading and balance
  - Center of gravity
- Flight maneuvers
  - Control surface movement (fixed-wing)
  - Motor direction (multirotor)
  - Vertical takeoff and landing (VTOL)

Performance Skills

- Demonstrate flight principles using a student-constructed drone.
- Describe how changes in design and construction impact aerodynamics.
- Find and identify component specifications in order to distinguish compatible components.

STRAND 3: UAS PROGRAMMING

Students will understand the assembly, integration, and calibration of UAS components.

Standard 1

Identify UAS Transmitter (TX) and Receiver (RX) functions.

- Protocols
  - PWM, PPM, SBUS, IBUS
  - Open Source programming (Betaflight, iNav, Adrupilot, Mission Planner)
- Mode Switching
- Types and Uses
- Programming Basics (failsafe, initial setup, throttle cut, reversing servos)

Standard 2

Compare transmitter/receiver binding techniques and identify troubleshooting practices.

Standard 3

Show knowledge of Electronic Speed Controller (ESC) calibration.

- Standard calibration protocol using sound indicators

Standard 4

Assess Proportional-Integral-Derivative (PID) loops and motor tuning and how to use them in an iterative process.

Performance Skills

- Successfully pair a transmitter and receiver on two different systems.
- Present solution steps and/or mitigation steps of an unpairing mid-flight event.
- Demonstrate switching modes on a transmitter.
- Modify the programmed performance of a motor.

STRAND 4: DESIGN PROCESS

Students will use the Engineering Design Process (EDP) to design UAS modifications with an intended purpose in mind.

Standard 1

Examine the steps of the Engineering Design Process (EDP).

1. Identify and define the problem
2. Brainstorm solutions
3. Create a model
4. Test the prototype
5. Iteration
6. Communicate results

Standard 2

Determine a goal of increased efficiency in one or more metrics of drone performance.

Performance Skills

- Use the EDP to demonstrate a modification to a drone that achieves an intended goal.
- Present design ideas utilizing knowledge of motors, batteries, ESCs, and propellers.
- Design a UAS from scratch and justify methods, material choices, and cost.
- *(optional)* Build a student-designed UAV.

STRAND 5: UAS MX DOCUMENTATION

Students will demonstrate maintenance (MX) documentation techniques and skills related to UAS building and/or MX.

Standard 1

Recognize documentation elements in a build or repair process.

Standard 2

Identify the uses and importance of a MX log.

Standard 3

Define preventative MX as it relates to UAS.

Performance Skills

- Present build or repair documentation.
- Maintain an appropriate MX log book.
- Using a UAV manual, summarize the drone's preventative maintenance.

STRAND 6: CAREERS

Students will explore potential careers related to UAS maintenance and design.

Standard 1

Students will explore differences in aircraft that allow it to perform specialized tasks.

- Quad or Multi-Rotor Vertical Takeoff
- Racing (First Person View)
- Fixed-Wing
- Mini
- Emerging technology drones
- Other Unmanned Systems

Standard 2

Explore careers related to the UAS maintenance industry.

- Drone Engineer
- Drone Technician
- UAS Software Developer
- UAS Hardware Designer
- Drones Sales Specialist
- UAS Maintenance Specialist

Performance Skills

- Present a personalized UAS post-secondary plan (college or career).
- Pass The Recreational UAS Safety Test (TRUST).

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		
UAS: Design & Maintain	672												

STRANDS AND STANDARDS

UAS: REMOTE PILOT CERTIFICATION

Learning that works for Utah
CTE®

Course Description

UAS Remote Pilot Certificate provides students with the opportunity to prepare for the Federal Aviation Administration (FAA) Part 107 certificate exam to operate commercially within the National Airspace System (NAS). The course covers rules and regulations, airspace classification and systems, aviation weather, loading and performance, and aeronautical decision making.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	40.11.00.00.052
Concurrent Enrollment Core Code	40.11.00.13.052
Prerequisite	Unmanned Aircraft Systems (UAS)
Skill Certification Test Number	673
Skill Certification Cut Score	**80%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Aviation - Flight
Endorsement 2	Unmanned Aircraft Systems

Updated: October 2024

STRAND 1: RECREATIONAL FLIGHT

Students will recognize Federal Aviation Administration (FAA) recreational pilot privileges and limitations as outlined in the Exception for Recreational Flyers.

Standard 1

Recall FAA recreational flying requirements of The Recreational UAS Safety Test (TRUST) including but not limited to:

- General
- FAA-recognized Community Based Organization (CBO)
- Visual line of sight
- Use of a visual observer (VO) co-located and in direct communication with the pilot
- Give way and do not interfere with other aircraft
- Fly at or below FAA-authorized altitudes in controlled airspace only with prior authorization
- Fly at or below 400 feet in Class G airspace
- Low Altitude Authorization and Notification Capability (LAANC)
- DroneZone
- B4UFLY
- Drone registration
- Remote Identification
- Do not operate your drone in a manner that endangers the safety of the National Airspace System (NAS)
- Remain current on TRUST regulations per annual updates

Standard 2

Understand the pilot's responsibility to the UAS community.

Performance Skills

- Earn an FAA TRUST certificate for recreational flyers.
- Have an FAA TRUST certificate accessible while operating UAS.
- Demonstrate recreational flying requirements in accordance with FAA regulations.

STRAND 2: RULES AND REGULATIONS

Students will gain an understanding of current Federal Aviation Administration (FAA) Small Unmanned Aircraft Systems (sUAS) rules and regulations applicable to flying drones legally in commercial operations in the NAS.

Standard 1

Identify FAA remote pilot certification privileges and limitations as outlined in 14 Code of Federal Regulations (CFR) Part 107 Subparts A & B - General, Operating Conditions.

- Supporting crew roles
- Falsification, reproduction, or alteration
- Accident reporting - FAA inspections
- sUAS Registration
- Remote identification (Remote ID/RID)
- Preflight procedures
- Carriage of hazardous material
- Operation at night
- Visual Line of Sight (VLOS)
- Operating limitations
- Right-of-Way rules
  - Collision avoidance (see-and-avoid)
- Operation from moving vehicles or aircraft
- Privacy considerations

Standard 2

Recall FAA remote pilot certification privileges and limitations as outlined in 14 CFR Part 107 Subpart C - Remote Pilot Certification.

- Certification and eligibility
- Testing and recency/renewal
- Change of address
- Alcohol and drugs
- Transponder / Automatic Dependent Surveillance-Broadcast (ADS-B) Out prohibition

Standard 3

Interpret FAA remote pilot certification privileges and limitations as outlined in 14 CFR Part 107 Subpart D - Operations over people.

- Operation over human beings/Operation Over People (OOP)
- Limitations
- OOP category requirements
  - Category 1
  - Category 2
  - Category 3
  - Category 4
- Operation over moving vehicles

Standard 4

Summarize FAA remote pilot certification privileges and limitations as outlined in 14 CFR Part 107 Subpart E - Waivers.

Standard 5

Reference other associated regulations within 14 CFR and Federal Guidelines as they relate to UAS Operations.

- Part 91
- Part 48
- Part 89
- Part 61
- Advisory Circular Documentation

Performance Skills

- Demonstrate the ability to find/lookup appropriate rules and regulations for a simulated scenario.
- Present a personalized timeline for acquiring a remote pilot certificate.
- Demonstrate the ability to use the pilot dashboard on faadronezone.com for registration, waivers, and accident reporting.

STRAND 3: NATIONAL AIRSPACE SYSTEM

Students will interact with digital and physical maps and resources to safely operate a UAS within the NAS.

Standard 1

Recall applicable classification and resources utilized within the NAS.

- Notice to Air Missions (NOTAMs) and Temporary Flight Restrictions (TFRs)
- Airspace resources (testing supplement, legends, special use airspace sidebar, digital mapping software/websites, chart supplements)
- Airspace classification and application
- Latitude and longitude

Standard 2

Identify standard aviation communication practices and procedures related to aircraft operations in the NAS.

- Airport operations
  - Traffic patterns
  - Runway details
  - Markings
  - Signs
- Expected aviation communication protocols

Standard 3

Identify elements and applications of Visual Flight Rule (VFR) sectional maps.

- Topography
- Obstacles and ground features
  - Elevation notation
- Traffic routes

Standard 4

Interpret and identify communication procedures related to sUAS operations in both controlled and uncontrolled airspace.

- Radio communication procedures (monitoring, emergency, use)
- Phonetic alphabet
- Airport identification information and amenities (Automatic Terminal Information Service (ATIS), Air Traffic Control towers (ATC))

Performance Skills

- Identify airspace classification, airport operations specifics, and general topography on a VFR sectional chart (digital or paper).
- Demonstrate appropriate radio communication skills combined with traffic pattern integration.
- Present application of map identification skills related to sectional charts between two points.

STRAND 4: AVIATION WEATHER

Students will apply aviation weather principles, weather report interpretation, weather effects on drone performance, and weather minimum regulations to the responsibilities of a UAS pilot.

Standard 1

Recall weather and visibility minimums required for unmanned aircraft operations.

- 3 SM (Statute Miles) of visibility
- 500 vertical feet from a cloud
- 2000 horizontal feet from a cloud
- UAV-specific limitations (Ingress Protection (IP) ratings, wind speed capacity, temperature tolerance)

Standard 2

Classify weather formation and development related to pilot operations.

- Uneven surface heating (causes of weather phenomena)
- Wind (direction, speed, sheer, turbulence)
- Air masses (stable and unstable characteristics)
- Fronts
- Atmospheric stability (barometric pressure and lapse rate)

Standard 3

Interpret types of weather phenomena and their effects on drone performance.

- Cloud types and height classifications
- Thunderstorms (development, stages, and hazards)
- Icing
- Fog (5 types and formation conditions)
- Density altitude
- Extreme weather (Squall Line, SIGMET, Convective SIGMET)

Standard 4

Interpret weather briefings and reporting related to being an unmanned pilot operating in the NAS.

- Accepted weather information sources
  - National Oceanic and Atmospheric Administration (NOAA)
  - AviationWeather.gov
  - 1800wxbrief.com
- Weather Briefings
  - Go/No-Go decision-making
  - Outlook briefing
- Weather Reports, Forecasts, and Charts
  - Meteorological Aerodrome Report (METAR)
  - Terminal Area Forecast (TAF)
  - Significant Meteorological Information (SIGMET)
  - Airmen's Meteorological Information (AIRMET)
  - Prognostic charts

Performance Skills

- Describe how different cloud characteristics will influence flight planning.
- Calculate density altitudes and determine the effect on UAV performance.
- Decipher weather reports, forecasts, and charts.
- Make and justify a Go/No-Go decision based on aviation weather information and reports.

STRAND 5: OPERATIONS

Students will identify and interpret loading and performance considerations for sUAS operations as outlined by the FAA.

Standard 1

Demonstrate basic aircraft controls and flight maneuvers.

- Controls (aileron, elevator, rudder)
- Maneuvers (roll, pitch, yaw)
- Stability (longitudinal, lateral, and vertical axes)

Standard 2

Apply loading considerations to a variety of sUAS.

- Speed and altitude (telemetry, pilotage, dead reckoning)
- Loading (capacity and center of gravity)
- Weight and balance
- Load Factor (g-force calculation)

Standard 3

Compare performance factors as applied to a variety of sUAS and flight conditions.

- Stalls (angle of attack, chord line, stall speed)
- Flight time and characteristics
- Maintenance
- Inspection procedures

Standard 4

Identify human physiology conditions as applied to 14 CFR Part 107 remote pilot medical considerations.

- Hyperventilation
- Dehydration
- Heatstroke
- Hypothermia
- Stress (including chronic)
- Fatigue (chronic, acute)

Performance Skills

- Demonstrate appropriate preflight/postflight checklist implementation in a flight scenario.
- Identify the remedy(ies) to multiple physiological conditions that would adversely impact the performance of a flight crew member.

STRAND 6: AERONAUTICAL DECISION MAKING

Students will identify operations tasks and procedures as well as Aeronautical Decision Making (ADM) skills as applied in aviation and as a remote pilot.

Standard 1

Apply preflight tasks appropriate to remote PIC responsibilities.

- Preflight visual inspection and functional check
- Low altitude test flight and control check
- Equipment damage or malfunction evaluation

Standard 2

Summarize emergency procedures related to appropriate responses of abnormal sUAS flight situations.

- Lost link
- Flight termination
- Flyaways (reporting procedures)
- Loss of GPS
- Battery fires (in flight, while charging, in storage)

Standard 3

Utilize the aeronautical decision making process as a remote PIC or crewmember.

- Crew Resource Management (CRM)
  - Resource identification
  - IMSAFE checklist
  - PAVE checklist
- Safety Management Systems (SMS)
- Hazardous attitudes, indicators, and antidotes
- Risk management
  - Process
  - CARE checklist

Performance Skills

- Present ADM/CRM skills utilizing appropriate checklists in a Go/No-Go scenario.
- Lead a preflight safety briefing.
- Describe an appropriate plan-of-action response to an in-flight emergency for various flight crew roles.

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		
UAS: REMOTE PILOT CERTIFICATION	673												

STRANDS AND STANDARDS

UAS: PHOTO AND VIDEO

Learning that works for Utah
CTE®

Course Description

This course provides students with the opportunity to learn about using drones as tools in a project-based course focusing on foundational skills with the design and critique process. This course covers photography basics, videography basics, FAA operation limitations, and explores some basic editing or post-processing skills in preparation for using aerial photography as an entryway to a UAS career.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	40.11.00.00.056
Concurrent Enrollment Core Code	N/A
Prerequisite	Unmanned Aircraft Systems (UAS)
Skill Certification Test Number	N/A
Skill Certification Cut Score	**N/A**
Test Weight	N/A
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Aviation - Flight
Endorsement 2	Unmanned Aircraft Systems

Updated: October 2024

STRAND 1: RECREATIONAL FLIGHT

Students will recognize Federal Aviation Administration (FAA) recreational pilot privileges and limitations as outlined in the Exception for Recreational Flyers and in the Code of Federal Regulations for commercial UAS operators.

Standard 1

Recall FAA recreational flying requirements of The Recreational UAS Safety Test (TRUST) including but not limited to:

- General
- FAA-recognized Community Based Organization (CBO)
- Visual line of sight
- Use of a visual observer (VO) co-located and in direct communication with the pilot
- Give way and do not interfere with other aircraft
- Fly at or below FAA-authorized altitudes in controlled airspace only with prior authorization
- Fly at or below 400 feet in Class G airspace
- Low Altitude Authorization and Notification Capability (LAANC)
- DroneZone
- B4UFLY
- Drone registration
- Remote Identification
- Do not operate your drone in a manner that endangers the safety of the National Airspace System (NAS)
- Remain current on TRUST regulations per annual updates

Standard 2

Understand the pilot's responsibility to the UAS community.

Standard 3

Analyze compensation types and situations, intent, and responsibility for multiple purposes vs. for purely recreational flight.

- 49 U.S.C. §44809(c)

Performance Skills

- Earn a recent (12 months) FAA TRUST certificate for recreational flyers.
- Have an FAA TRUST certificate accessible while operating UAS.
- Demonstrate recreational flying requirements in accordance with FAA regulations.
- Present a plan for following Part 107 regulations related to publishing creative work.

STRAND 2: UAS PHOTO BASICS

Students will gain an understanding of photography skills as they relate to UAS project development.

Standard 1

Demonstrate basic photography composition elements using a drone.

- Rule of thirds
- Fill the frame
- Leading Lines
- Framing
- Rule of odds
- Balance
- Contrast
- Perspective
- Golden ratio
- Dynamic vs. static
- Space

Standard 2

Show UAS flight maneuvers and settings to achieve specific photographic composition goals.

- Drone flight and camera settings
- Fly lower and/or closer
- Flight planning
- Auto Exposure Bracketing (AEB)
- Burst shots
- Physical Filters (Neutral Density (ND), polarizer, orbital)

Standard 3

Investigate common editing processes for photos.

- Overlays
- Cropping/horizon leveling
- Adjustments (exposure, color/hue, saturation, contrast, sharpening, effects)
- Merging

Performance Skills

- Compose multiple UAS photographic images using flight skills, composition elements, and appropriate purpose.
- Demonstrate editing techniques appropriate for publishing in a portfolio.
- Analyze, evaluate, and critique own photographic work and identify areas for improvement.
- Create a professional portfolio of your photographic media.

STRAND 3: UAS VIDEO BASICS

Students will gain an understanding of videography skills as they relate to UAS project development.

Standard 1

Demonstrate basic photography composition elements during UAS videography flight movements for an intended purpose.

- Gimbal (pan, tilt, roll)
- Moving shots (crane, dolly, truck, pedestal, orbit)
- Zoom (changing focal length)

Standard 2

Show UAS flight maneuvers and settings to achieve specific videographic composition goals.

- Drone flight and camera settings
- Fly lower and/or closer
- Fly-through (structure)
- Reveal
- Flight planning
- Physical Filters (Neutral Density (ND), polarizer, orbital)

Standard 3

Apply common editing processes for videos.

- Audio/music synchronization
- Transitions
- Speed-up/Slow-down
- Frame rate matching
- Clipping/trimming
- Overlays
- Cropping/horizon leveling
- Adjustments (exposure, color/hue, saturation, contrast, sharpening, effects)

Performance Skills

- Compose multiple UAS videos using flight skills, composition elements, and appropriate purpose.
- Demonstrate appropriate video editing techniques for publishing in a portfolio.
- Analyze, evaluate, and critique own videographic work and identify areas for improvement.
- Add video media to your professional digital portfolio.

STRAND 4: UAS PROJECT DESIGN & DEVELOPMENT

Students will design an appropriate UAS project and practice effective critiquing techniques.

Standard 1

Apply the design process to UAS operation flight planning.

- Research (audience, purpose, timeline, production method, shot list, schedule)
- Brainstorming (sketches)
- Crew/cast responsibilities (flight log, FAA Certification, maintenance, roles, etc.)
- Use feedback to inform revisions and changes to work.

Standard 2

Construct a flight plan for photo/video purposes.

Standard 3

Determine digital assets for publishing.

Standard 4

Identify the steps in the critique process of UAS projects.

- Describe
- Analyze
- Interpret
- Evaluate

Standard 5

Summarize potential legal and fair use components related to publishing creative or other projects.

- Fair use
- Public domain
- Creative commons
- Copyright

Performance Skills

- Utilize the design process when developing UAS projects.
- Complete a portfolio of high quality photographic and videographic work.
- Determine an appropriate publishing outlet and publish your student portfolio.
- Present an analysis, evaluation, and critique of your own portfolio and identify areas for improvement.
- Practice ethics and rules governing creative works.

STRAND 5: INDUSTRY APPLICATIONS

Students will investigate UAS career opportunities.

Standard 1

Research career opportunities and how aerial photography and videography applies to various industries.

- Real estate
- Surveying and mapping
- Environmental monitoring
- Event photography, media, and entertainment
- Tourism
- Agriculture
- Inspection and maintenance
- Urban Planning
- Insurance
- Search and Rescue

Standard 2

Identify emerging industry use of aerial photography and videography in potential future applications.

- Public services
- Construction & engineering
- Forest Service
- Surveillance
- Military
- Transportation (Urban Air Mobility, Powered Lift)

Standard 3

Develop and log flights to prepare for UAS careers.

Performance Skills

- Present a personalized UAS post-secondary plan (college or career).

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		
UAS: PHOTO & VIDEO													

STRANDS AND STANDARDS

UAS: CAPSTONE

Learning that works for Utah
CTE®

Course Description

UAS Capstone is a project-oriented course that may be an internship with a UAS company, research project, advanced application of UAS skills, participation in a CTSO competition, partnered project with a university, or a design/build project. This course is the pinnacle in this pathway and is designed to provide a kickstart to a student's post-secondary plans in Unmanned Aircraft Systems and is also geared toward developing a student's professional skills.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	40.11.00.00.058
Concurrent Enrollment Core Code	N/A
Prerequisite	UAS: Remote Pilot Certification
Skill Certification Test Number	N/A
Skill Certification Cut Score	**N/A**
Test Weight	N/A
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Aviation-Flight
Endorsement 2	Unmanned Aircraft Systems

Updated: November 2024

STRAND 1: RESPONSIBLE FLIGHT

Students will recognize the privileges and limitations of flying UAS responsibly, including Federal Aviation Administration (FAA) recreational and commercial requirements.

Standard 1

Confirm FAA recreational flying requirements of The Recreational UAS Safety Test (TRUST) including but not limited to:

- General requirements
- FAA-recognized Community Based Organization (CBO)
- Visual line of sight (VLOS) and Visual Observer (VO)
- Airspace limitations and authorization
- DroneZone, registration and Remote Identification (RID, Remote ID)
- B4UFLY
- Do not operate your drone in a manner that endangers the safety of the National Airspace System (NAS) or interferes with other aircraft

Standard 2

Confirm FAA requirements per the Code of Federal Regulations for commercial UAS operators.

- General requirements
- Commercial operations and limitations
- Waivers and authorizations

Standard 3

Demonstrate the pilot's responsibility to the UAS community.

- Recreational limitations vs commercial limitations

Standard 4

Analyze compensation types and situations, intent, and responsibility for multiple purposes vs. for purely recreational flight. · 49 U.S.C. §44809(c)

Performance Skills

- Earn a recent (12 months) FAA TRUST certificate or Remote Pilot Certificate (Part 107) with recurrent training as needed.
- Have an FAA TRUST or Part 107 certificate accessible while operating UAS.
- Demonstrate safe recreational flying practices in accordance with FAA regulations.
- Present a plan for following Part 107 regulations related to publishing creative work.

STRAND 2: INDUSTRY DELIVERABLES

Students will gain or increase their understanding of various deliverables typically provided via UAS in industry, including deliverables using emerging technologies.

Standard 1

Identify basic deliverable options in UAS under Part 107.
Examples include but are not limited to:

- Orthomosaics, Digital Surface Maps (DSMs), and Digital Terrain Maps (DTMs)
- 3D models
- Thermal maps or images
- Agricultural applications including NDVI maps (plant health, fertilizer efficacy, plant categorization)
- Research and development (design, components, flight testing, battery composition)
- Volumetrics (stockpile reports, water levels, dirt levels, surface material estimates)
- Search and rescue operations
- Public service and first responders
- Inspections (solar panels, roof, power lines, bridge, thermal, ranch, building)
- Tourism (videos, postcards, calendars, maps, cautions, historic sites)
- Wildlife mitigation (animal counts, migration patterns, bedding patterns)
- Monitoring, progress reports, time lapse (construction, water levels, snow pack, trail maintenance)
- Geospatial Information Systems (GIS) applications

Standard 2

Compare UAS software options for processing deliverables.
Examples include but are not limited to:

- Adobe
- Pix4D
- Skybrowse
- Drone Deploy
- LP360
- Agisoft Metashape
- ArcGIS Drone2Map
- Autodesk Recap Pro & Recap Photo

Performance Skills

- Present a UAS project plan using a combination of deliverables and software options.

STRAND 3: UAS CAREER READINESS

Students will develop an understanding of professional interactions in a variety of situations and prepare to engage appropriately in public and digital settings.

Standard 1

Analyze digital portfolio pieces typical to a UAS career portfolio.

- Social media
- Webpage
- Project presentation
- Digital resume and cover letter
- Current UAS flight log

Standard 2

Identify digital professional networking profile elements.

- Cover photo
- Profile photo
- Profile bio and certifications
- Platform functions
- Professional messaging and communication

Standard 3

Show appropriate UAS-related resume and cover letter elements.

- Career objective
- Education
- Work experience
- Summary of flight experience
- Skills and interests
- Volunteer/memberships/leadership
- References
- Appropriate format
- Automated screening strategies

Standard 4

Develop strategies for appropriate, professional behavior.

- Communication (written, verbal, nonverbal)
- Settings (conferences, interviews, career fairs, digital meetings, WBL opportunities, volunteer work, etc.)

Performance Skills

- Create or update a personal resume and/or portfolio for a UAS career.
- Present an analysis of a professional social networking profile.
- Participate in a career-building, professional development, or community service UAS-related opportunity.
- Present a personalized UAS post-secondary plan (college or career).

STRAND 4: UAS STUDENT PROJECT

Students will participate in a chosen project in collaboration with a specific organization, business, school, or industry partner.

Standard 1

Participate in a work-based learning experience outside the classroom including, but not limited to:

- Professional video for a business, school, or community partner from conception, approval, implementation, and completion of project
- Collect agricultural data for a local farmer
- Monitor production and progress at a construction site
- Test drones to evaluate varieties for a specific project or test different set ups with propellers/sensors/ payloads
- Work with a college/university student or group on a project

Standard 2

Develop a project book throughout a student-chosen project including the following skills and elements:

- Preflight considerations
- Client communication
- Scheduling
- Aeronautical Decision Making (ADM)
- Crew Resource Management (CRM)
- Results

Performance Skills

- Demonstrate ADM and CRM skills via a student-chosen, advisor-approved UAS project.
- Present timely project-related progress reports to include accountability for actions and deadlines.
- Present an original project as applied to an individual project book.

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		
UAS: CAPSTONE													