College & Career Advantage Badges

California CTE Industry Sectors

The state of California organizes Career Technical Education (CTE) into 15 industry sectors. Within each sector, content is organized into Pathways, which are programs of study. Below are the images for each Industry Sector, which link to the section listing the Pathways available to our students in each industry sector.

Clicking on the Level 2, 3, or Pathway Completer badge image will link you to the standards taught within that Pathway for your review. This list represents the knowledge students acquire after completing each course in their pathway.

Students earning Level 1, Level 2, or Pathway Completer badges have met the core competencies and curriculum standards for the designated program as outlined by the State of California and the Regional Occupational Program (ROP).

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Click on the industry sector icon below to navigate to your pathway:


Agriculture & Natural Resources

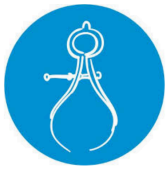

Arts, Media, & Entertainment


Building & Construction Trades


Business & Finance


Education & Child Development


Energy, Environment & Utilities


Engineering & Architecture


Fashion & Interior Design


Health Science & Medical Technology


Hospitality, Tourism & Recreation


Information & Communication Technologies


Manufacturing & Product Development


Public Services


Transportation

Agriculture & Natural Resources

[ANIMAL SCIENCE PATHWAY]

Arts Media, and Entertainment

[DESIGN, VISUAL, & MEDIA ARTS PATHWAY]


DIGITAL PHOTOGRAPHY
College & Career Advantage
LEVEL 2

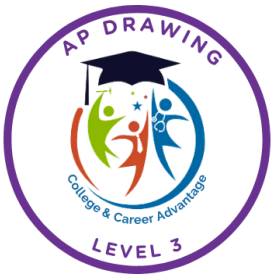

DIGITAL PHOTOGRAPHY, ADVANCED
College & Career Advantage
LEVEL 3


DIGITAL PHOTOGRAPHY SOCSA
College & Career Advantage
LEVEL 2


MULTIMEDIA DESIGN, SOCSA
College & Career Advantage
LEVEL 2


3D MEDIA DESIGN HONORS
College & Career Advantage
LEVEL 3


AP 2D ART & DESIGN
College & Career Advantage
LEVEL 3


AP DRAWING
College & Career Advantage
LEVEL 3


ART ENTREPRENEURSHIP
College & Career Advantage
LEVEL 3


ART PRODUCTION 2
College & Career Advantage
LEVEL 2


MULTIMEDIA PRODUCTION
College & Career Advantage
LEVEL 1


MULTIMEDIA DESIGN ADVANCED
College & Career Advantage
LEVEL 2


MULTIMEDIA DESIGN HONORS
College & Career Advantage
LEVEL 2


MULTIMEDIA DESIGN
College & Career Advantage
LEVEL 2


ART OF GRAPHIC DESIGN
College & Career Advantage
LEVEL 2


GRAPHIC PRODUCTION TECH
College & Career Advantage
LEVEL 3


MULTIMEDIA DESIGN ADVANCED
College & Career Advantage
LEVEL 2


MULTIMEDIA DESIGN ADVANCED
College & Career Advantage
LEVEL 2


GRAPHIC DESIGN
College & Career Advantage
PATHWAY COMPLETER


MULTIMEDIA DESIGN, SOCSA
College & Career Advantage
LEVEL 2


VIDEO PRODUCTION, ADVANCED
College & Career Advantage
LEVEL 3


VIDEO PRODUCTION
College & Career Advantage
LEVEL 3


ART ANIMATION
College & Career Advantage
LEVEL 2


PUBLISHING DESIGN 1 -NEWSPAPER
College & Career Advantage
LEVEL 2


PUBLISHING DESIGN 1 -YEARBOOK
College & Career Advantage
LEVEL 2


PUBLISHING DESIGN 3 NEWSPAPER
College & Career Advantage
LEVEL 2


PUBLISHING DESIGN 3 YEARBOOK
College & Career Advantage
LEVEL 2


TV BROADCAST JOURNALISM
College & Career Advantage
LEVEL 3


MULTIMEDIA DESIGN, SOCSA
College & Career Advantage
LEVEL 2


PUBLISHING DESIGN 4 NEWSPAPER
College & Career Advantage
LEVEL 3


PUBLISHING DESIGN 4 YEARBOOK
College & Career Advantage
LEVEL 3


ART ANIMATION ADVANCED
College & Career Advantage
LEVEL 3


PUBLISHING DESIGN 4 NEWSPAPER
College & Career Advantage
LEVEL 3


DESIGN, VISUAL & MEDIA ARTS
College & Career Advantage
PATHWAY COMPLETER

PERFORMING ARTS PATHWAY


DANCE PERFORMANCE
College & Career Advantage
LEVEL 2


DANCE PERFORMANCE ADVANCED
College & Career Advantage
LEVEL 3


ACTORS' REPERTORY
College & Career Advantage
LEVEL 3


DANCE II
College & Career Advantage
LEVEL 2


DANCE III
College & Career Advantage
LEVEL 3


DANCE/CHOREOGRAPHY
College & Career Advantage
PATHWAY COMPLETER


DANCE PRODUCTION, SOCSA
College & Career Advantage
LEVEL 3


PERFORMING ARTS
College & Career Advantage
PATHWAY COMPLETER

PRODUCTION & MANAGERIAL ARTS PATHWAY

GAME DESIGN & INTEGRATION PATHWAY

Building & Construction Trades

CABINETRY, MILLWORK, & WOODWORKING PATHWAY

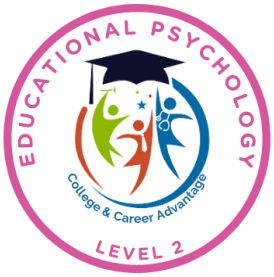
RESIDENTIAL & COMMERCIAL CONSTRUCTION PATHWAY

Business & Finance

[BUSINESS MANAGEMENT PATHWAY]

Education, Child Development & Family Services

EDUCATION PATHWAY



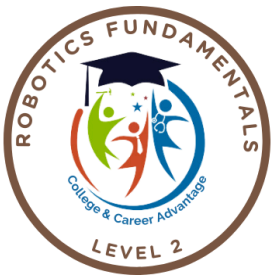
Energy, Environment, & Utilities

ENVIRONMENTAL RESOURCES PATHWAY

Engineering & Architecture

ARCHITECTURAL DESIGN PATHWAY

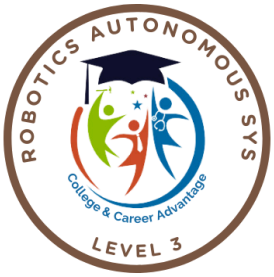
ENGINEERING DESIGN PATHWAY




RAPID PROTOTYPE
College & Career Advantage
LEVEL 2


ENGINEERING DESIGN & DEVELOPMENT
College & Career Advantage
LEVEL 3


ENGINEERING MFG. TECHNOLOGY
College & Career Advantage
LEVEL 3


ROBOTICS AUTONOMOUS SYS
College & Career Advantage
LEVEL 3


ROBOTICS SYSTEMS INTEGRATION
College & Career Advantage
LEVEL 3


ENGINEERING DESIGN
College & Career Advantage
PATHWAY COMPLETER

Fashion & Interior Design

FASHION DESIGN & MERCHANDISING PATHWAY

Health, Science, & Medical Technology

BIOTECHNOLOGY PATHWAY

PATIENT CARE PATHWAY


SURGICAL TECH BASICS
College & Career Advantage
LEVEL 2


SPORTS MEDICINE
College & Career Advantage
LEVEL 2


SPORTS MEDICINE ADVANCED
College & Career Advantage
LEVEL 3


MEDICAL/HOSPITAL CAREERS
College & Career Advantage
LEVEL 3


PHARMACY TECHNICIAN
College & Career Advantage
LEVEL 3


PATIENT CARE
College & Career Advantage
PATHWAY COMPLETER

Hospitality, Tourism, & Recreation

FOOD SERVICE & HOSPITALITY PATHWAY

Information & Communication Technology

NETWORKING PATHWAY

GAMES & SIMULATIONS PATHWAY

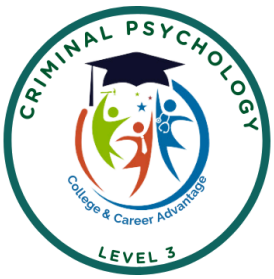
SOFTWARE & SYSTEMS DEVELOPMENT PATHWAY

Manufacturing & Product Development

MULTIPLE PATHWAYS

Public Services

PUBLIC SAFETY PATHWAY



EMERGENCY RESPONSE PATHWAY

Transportation

SYSTEMS DIAGNOSTICS, SERVICE & REPAIR PATHWAY

OPERATIONS PATHWAY

Agriculture & Natural Resources

ANIMAL SCIENCE PATHWAY (103)

In the Animal Science pathway, students study large, small, and specialty animals. Students explore the necessary elements, such as diet, genetics, habitat, and behavior, to create humane, ecologically, and economically sustainable animal production systems. The pathway includes the study of animal anatomy and physiology, nutrition, reproduction, genetics, health and welfare, animal production, technology, and the management and processing of animal products and by-products.

Level 1 students have been introduced to the content
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Pathway Completer students have mastered the content

Animal Science Pathway Students Will:

- Evaluate the necessary elements for proper animal housing and animal-handling equipment.
- Design an animal facility focusing on appropriate space and location requirements for habitat, housing, feed, and water.
- Select habitat and housing conditions and materials, such as indoor and outdoor housing, fencing materials, air flow/ventilation, and shelters, to meet the needs of various animal species.
- Interpret animal behaviors and execute protocols for safe handling of animals.
- Defend the purpose and the safe and humane use of animal husbandry tools, such as hoof trimmers, electric shears, elastrators, dehorning tools, and

scales.

- Apply principles of animal nutrition to ensure the proper growth, development, reproduction, and economic production of animals.
- Assess the flow of nutrients from the soil, through the animal, and back to the soil.
- Explore the principles for providing proper, balanced rations for a variety of production stages in ruminants and monogastrics.
- Compare the digestive processes of the ruminant, monogastric, avian, and equine digestive systems.
- Distinguish how animal nutrition is affected by the digestive, endocrine, and circulatory systems.
- Apply principles of comparative anatomy and physiology to uses within various animal systems.
- Compare and contrast animal cells, tissues, organs, and body systems.
- Develop efficient procedures to produce consistently high-quality animals that are well suited for their intended purposes.
- Relate the importance of animal organs to the health, growth, and reproduction of animals.
- Demonstrate understanding of animal reproduction, including the function of reproductive organs.
- Illustrate animal conception, including estrus cycles, ovulation, and insemination. D4.2 Research the gestation process and basic fetal development.
- Explain the parturition process, including the identification of potential problems and their solutions.
- Select animal breeding methods based on reproductive and economic efficiency.
- Select a breeding system based on the principles of genetics.
- Discuss animal inheritance and selection principles, including the structure and role of deoxyribonucleic acid (DNA).
- Evaluate a group of animals for desired qualities, and discern among them for breeding selection.
- Select animals, based on quantitative breeding values, for specific characteristics.
- Research and discuss current technology used to measure desirable traits.
- Predict phenotypic and genotypic results of a dominant and recessive gene pair.
- Research the role of mutations, both naturally occurring and artificially induced, and hybrids in animal genetics.
- Prescribe and implement a prevention treatment program for animal diseases, parasites, and other disorders.
- Evaluate the signs of normal health in contrast to illness and disease.
- Analyze the importance of animal behavior in diagnosing animal sickness and disease. D6.3 Research common pathogens, vectors, and hosts that cause disease in animals.
- Evaluate preventative measures for controlling and limiting the spread of diseases, parasites, and disorders among animals.
- Discuss procedures used at the local, state, and national levels to ensure biosecurity of the animal industry.
- Explain the health risk of zoonotic diseases to humans, their historical influence, and future implications.
- Discuss the impacts on local, national, and global economies, as well as on

consumers and producers, when animal diseases are not appropriately contained and eradicated.
- Explore common pasture and rangeland management practices and their impact on a balanced ecosystem.
- Evaluate a rangeland and identify methods of rangeland improvement used in an effective animal production program.
- Summarize how rangeland management practices affect pasture production, erosion control, and the general balance of the ecosystem.

Arts Media, and Entertainment

DESIGN, VISUAL, & MEDIA ARTS PATHWAY

The Design, Visual, and Media Arts pathway includes those occupations that use visual art, digital media, and Web-based tools and materials as the primary means of communication and expression. In addition to an understanding of current workplace practice, this career pathway requires the development of knowledge and skills in both visual art concepts as well as new and emerging digital processes by which individuals are able to create and communicate complex concepts in a broad range of occupations and professions.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Design, Visual, & Media Arts Pathway Students Will:

- Demonstrate ability to reorganize and integrate visual art elements across digital media and design applications.
- View and respond to a variety of industry-related artistic products integrating industry appropriate vocabulary.
- Identify and use the principles of design to discuss, analyze, and create projects and products across multiple industry applications.
- Describe the use of the elements of art to express mood in digital or traditional art work found in the commercial environment.
- Select industry-specific works and analyze the intent of the work and the appropriate use of media.
- Research and analyze the work of an artist or designer and how the artist's distinctive style contributes to their industry production.
- Compare and analyze art work done using electronic media with those done with materials traditionally used in the visual arts.
- Analyze and discuss complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual in works of art.
- Compare how distortion is used in a variety of media to modify the message being communicated.
- Analyze the material used by a given artist and describe how its use influences the meaning of the work.
- Apply artistic skills and processes to solve a variety of industry-relevant problems in a variety of traditional and electronic media.
- Demonstrate skill in the manipulation of digital imagery (either still or video) in an industry-relevant application.
- Demonstrate personal style and advanced proficiency in communicating an idea, theme, or emotion in an industry-relevant artistic product.
- Apply refined observation and drawing skills to solve an industry-relevant problem. Use visual metaphors in creating an artistic product.

- Compile a portfolio of multiple original two- and three-dimensional works of art that reflect technical skills in an industry-relevant application.
- Create an artistic product that involves the effective use of the elements of art and the principles of design.
- Create original works of art of increasing complexity and skill in a variety of media that reflect their feelings and points of view.
- Plan and create artistic products that reflect complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual.
- Create a multimedia work of art that demonstrates knowledge of media and technology skills.
- Analyze and assess the impact of history and culture on the development of professional arts and media products.
- Identify and describe the role and influence of new technologies on the contemporary arts industry.
- Describe how the issues of time, place, and cultural influence are reflected in a variety of artistic products.
- Identify contemporary styles and discuss the diverse social, economic, and political developments reflected in art work in an industry setting.
- Identify art in international industry and discuss ways in which the work reflects cultural perspective.
- Analyze similarities and differences of purpose in art created in culturally diverse industry applications.
- Investigate and discuss universal concepts expressed in visual media products from diverse cultures.
- Analyze, assess, and identify effectiveness of artistic products based on elements of art, the principles of design, and professional industry standards.
- Develop written consumer assessment rubrics for separate, industry-specific art products.
- Deconstruct how beliefs, cultural traditions, and current social, economic, and political contexts influence commercial media (traditional and electronic).
- Analyze the aesthetic value of a specific commercial work of art and defend that analysis from an industry perspective.
- Analyze the relationship between the artist, artistic product and audience in both an existing and self-generated project.
- Analyze and articulate how society influences the interpretation and effectiveness of an artistic product.
- Create an artistic product for a specific industry and modify that product to accommodate a different aesthetic perspective.
- Identify essential industry competencies, explore commercial applications and develop a career specific personal plan.
- Compare and contrast the ways in which different artistic media (television, newspapers, magazines, and electronic media) cover the same commercial content.
- Explore the role of art and design across various industry sectors and content areas.
- Deconstruct works of art, identifying psychological content found in the symbols and images and their relationship to industry and society.

- Predict how changes in technology might change the role and function of the visual arts in the workplace.
- Create a commercial artistic product that communicates a cross-cultural or universal theme.
- Prepare portfolios of original art created for a variety of purposes and commercial applications.
- Synthesize traditional art work and new technologies to design an artistic product to be used by a specific industry.
- Analyze characteristics of subgenres (e.g., satire, parody, allegory, pastoral) that are used in poetry, prose, plays, novels, short stories, essays, and other basic genres.
- Evaluate the ways in which irony, tone, mood, the author's style, and the "sound" of language achieve specific rhetorical or aesthetic purposes or both.
- Analyze the way in which authors through the centuries have used archetypes drawn from myth and tradition in literature, film, political speeches, and religious writings.
- Debate the philosophical arguments presented in literary works to determine whether the authors' positions have contributed to the quality of each work and the credibility of the characters (philosophical approach).
- Demonstrate an understanding of the elements of discourse (e.g., purpose, speaker, audience, form) when completing narrative, expository, persuasive, or descriptive writing assignments.
- Use point of view, characterization, style (e.g., use of irony), and related elements for specific rhetorical and aesthetic purposes.
- Use language in natural, fresh, and vivid ways to establish a specific tone.
- Enhance meaning by employing rhetorical devices, including extended use of parallel ism, repetition, analogy; incorporation of visual aids (e.g., graphs, tables, pictures); and the issuance of a call for action.
- Integrate databases, graphics, and spreadsheets into electronically processed documents.
- Revise text to highlight the individual voice, improve sentence variety and style, and enhance subtlety of meaning and tone in ways that are consistent with the purpose, audience, and genre.
- Understand the key technical and technological requirements applicable to various segments of the Media and Design Arts Pathway.
- Understand the component steps and skills required to design, edit, and produce a production for audio, video, electronic, or printed presentation.
- Use technology to create a variety of audio, visual, written, and electronic products and presentations.
- Know the features and uses of current and emerging technology related to computing (e.g., optical character recognition, sound processing, cable TV, cellular phones).
- Analyze the way in which technical design (e.g., color theory, lighting, graphics, typography, posters, sound, costumes, makeup) contributes to an artistic product,
- performance, or presentation.
- Differentiate writing processes, formats, and conventions used for various media. Analyze and assess technical support options related to various media and design arts.
- Evaluate how advanced and emerging technologies (e.g., virtual environment or voice recognition software) affect or improve media and design arts products or productions.

PERFORMING ARTS PATHWAY

The Performing Arts pathway focuses on the direct creation of art and entertainment by the indi vidual artist instead of through a secondary physical medium. Performing artists are themselves the medium of creative expression.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Performing Arts Pathway Students Will:

- Explore and formulate responses to peer and professional work using the fundamental elements of Theater, Dance, and Music.
- Demonstrate movement skills, process sensory information, and describe movement using the professional vocabulary of dance.
- Apply highly developed physical coordination and control when performing complex locomotor and axial movement phrases from a variety of genres (e.g., refined body articulation, agility, balance, strength).
- Apply a wide range of kinesthetic communication demonstrating clarity of intent and stylistic nuance.
- Differentiate dance vocabulary to describe movement and dance in a professional setting.
- Create and perform complicated works of dance at a level of professionalism (i.e., a high level of refinement).
- Perform in multiple professional dance genres integrating an advanced level of technical skill and clear intent.
- Deconstruct formal and informal (improvisational) performances of theater, dance, and music, both live and electronic, and evaluate using appropriate artistic vocabulary.
- Read, listen to, deconstruct, and analyze peer and professional music using the elements and terminology of music.
- Read a full instrument or vocal score with a direct industry connection (Film score, Philharmonic score, commercial underscore).
- Describe how the elements of music are used.
- Transcribe simple songs into melodic and rhythmic notation when presented. B2.4 Sight-read music accurately and expressively.
- Analyze and describe significant musical events perceived and remembered in a given industry generated example.
- Analyze and describe the use of musical elements in a given professional work that makes it unique, interesting, and expressive.
- Demonstrate the different uses of form, both past and present, in a varied repertoire of music in commercial settings from diverse genres, styles, and professional applications.

- Observe, deconstruct, and analyze peer and professional theater, film, video, and electronic media and respond using the vocabulary of theater.
- Identify the use of metaphor, subtext, and symbolic elements in text and performance of professional theatrical work (live or recorded).
- Research, analyze, and plan a theatrical performance (live or recorded) with the director, designer, or playwright.
- Create a product which assesses professional theater, film, and video performance products using the vocabulary of theater, such as genre, style, acting values, theme, and design.
- Apply choreographic principles, processes, and skills to create and communicate meaning through improvisation, composition, and performance of dance for a variety of professional applications.
- Specify applications of VPA Creative Expression Standards for Dance at the proficient level.
- Notate dances using a variety of systems (Labanotation, motif writing, and personal systems).
- Apply basic music elements (rhythm, meter, tempo, timbre) to construct and perform dances for a variety of professional settings.
- Create a dance that utilizes an established dance style or genre in response to an industry-specific prompt.
- Perform works by various dance artists communicating the original intent of the work while employing personal artistic intent and interpretation.
- Perform combinations, in response to audition requirements, in a variety of professional dance genres that demonstrate proficiency relative to industry expectations.
- Create a diverse body of work in dance, which demonstrates originality, unity, clarity of intent, and a dynamic range of movement appropriate to a variety of professional applications.
- Create a performance piece using dance structures, musical forms, theatrical elements, and technology for a specific professional application.
- Perform original works that employ personal artistic intent and respond to industry specific criteria.
- Apply vocal and/or instrumental skill and knowledge to perform a varied repertoire of music appropriate to music industry application.
- Sing or play a repertoire of musical literature representing various genres, styles, and cultures with expression and technical accuracy.
- Sing or play music written in multiple parts, individually or with a group.
- Sight read and perform a brief musical composition from a professional resource.
- Employ a variety of music technology to record, integrate, or modify a live or recorded performance to produce a new artistic product.
- Compose music in distinct styles.
- Compose and arrange music for various combinations of voice and acoustic and digital/electronic instruments using appropriate ranges and traditional and nontradi tional sound sources.
- Create melodic and rhythmic improvisations in a style or genre within a musical culture (gamelan, jazz, and mariachi).

- Apply skill and knowledge in acting, directing, design, and composition to create formal and informal (improvised) theater, film, video, and electronic media performances.
- Demonstrate media appropriate acting choices using script analysis, character research, reflection, and revision in live and recorded performance applications.
- Use acting choices, such as script analysis, character research, reflection, and revision; and apply to a variety of professional settings.
- Create performance products applying basic dramatic structure: exposition, complica tion, conflict, crises, climax, and resolution.
- Design, produce, or perform scenes applicable to a variety of professional settings and media applications.
- Improvise or write dialogues and scenes applying basic dramatic structure (exposition, complication, crises, climax, and resolution) appropriate to a variety of industry settings.
- Work collaboratively as designer, producer, or actor to meet directorial goals in scenes and plays from a variety of professional sources.
- Analyze the historical and cultural perspective of multiple industry performance products from a discipline-specific perspective.
- Identify and compare how film, theater, television, and electronic media productions influence values and behaviors.
- Analyze the historical and cultural perspective of the dancer in the professional setting.
- Analyze the historical and cultural perspective of the musician in the professional setting.
- Analyze the historical and cultural perspective of the actor and performance artist in the professional setting.
- Create a product comparing and contrasting universal themes and sociopolitical issues in a variety of music, dance, or theatrical products.
- Deconstruct the aesthetic values that drive professional performance and the artistic elements necessary for industry production.
- Critique discipline-specific professional works using the language and terminology specific to the discipline.
- Use selected criteria to compare, contrast, and assess various professional performance forms.
- Analyze the aesthetic principles that apply in a professional work designed for live performance, film, video, or live broadcast.
- Use complex evaluation criteria and terminology to compare and contrast a variety of genres of professional performance products.
- Explore the connection between artistic preparation and professional standards and practices.
- Examine the training, education, and experience needed to pursue discipline-specific performance options.
- Demonstrate effective knowledge and skills with the audiovisual equipment and technology used in professional performance.
- Demonstrate entry-level competencies for a career in an artistic or technical field in the theatrical arts.
- Understand the technical aspects of lights, sound, properties, costumes, and makeup from the perspective of the professional performer.

- Contrast differing roles in professional skill sets of creators, performers, and others involved in the production and presentation of the performing arts.
- Create a career plan leading to professional performance in one of the performance disciplines.

PRODUCTION & MANAGERIAL ARTS PATHWAY

Whatever the form or medium of creative expression, all careers in the Arts, Media, and Entertainment sector require “publication” or a public presentation in one way or another. Consequently, the Production and Managerial Arts pathway focuses on both the technical skills and the organizational and managerial knowledge necessary to bring arts, media, and entertainment to the public.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Production & Managerial Arts Pathway Students Will::

- Demonstrate knowledge of industry safety standards and practices in all areas of technical production.
- Demonstrate understanding of various power tools used in construction and rigging.
- Demonstrate knowledge of basic electrical safety.
- Demonstrate understanding of safe workplace practices, including tool safety, rigging, electrical, and construction safety and awareness of hazardous materials in the workplace.
- Apply safety related decision making and problem-solving techniques to live, recorded, or multimedia generated production.
- Understand the technical support functions and artistic competencies in film, video, and live production.
- Analyze the production sequence involved in creating a media based or live performance production.
- Produce a production flow chart for a live theatrical or media based production.
- Plan one technical component of a production from design to performance.
- Analyze and differentiate the function of the various members of a production team.
- Identify the skills and competencies of the various members of a production team including producer, production manager, director, assistant director, stage manager, production designer(s), post production, etc.
- Demonstrate key skills and an understanding of the complexities of production planning.
- Know the main elements and functional responsibilities involved in the production and presentation of the performing, visual, and media arts.
- Know how artistic processes, organizational structure, and business principles, including funding and budgeting, are interrelated in both live and media production.

- Identify the responsibilities and activities associated with the preproduction, production, and post-production of a creative project.
- Demonstrate understanding of the appropriate use of technology in each phase of the production planning.
- Create a call sheet for equipment, crew, technical support, and cast requirements for an arts, media, and entertainment production.
- Apply knowledge of services, equipment capabilities, the workflow process, data acquisition, and technology to a timely completion of projects.
- Identify essential qualifications and technological competencies for each team member,
- including artists, designers, performers, composers, writers, and technicians.
- Plan the general coordination of various elements in a project or production.
- Understand the key elements of developing and promoting a production from creation to distribution.
- Design a production flow chart identifying chain of responsibility for a specific type of arts, media, and entertainment production.
- Create a budget for an aspect of an arts, media, and entertainment production of the arts, media, and entertainment industry.
- C6.3 Design a promotional packet demonstrating knowledge of promotional
- Create a promotional example using electronic media.
- Create a public service announcement using two or more production methods materials, such as standard public service announcements
- Know various media production, communication, and dissemination techniques and methods, including written, oral, visual, and electronic media.
- Identify and describe licensing management for live and media based productions and intellectual properties.
- Identify successful business models and analyze various facets of those models, such as market analysis, marketing strategy, and product value.
- Discuss the relationships between publishers, developers, distributors, marketers, and retailers.
- Understand the role of audience and market research in promotional planning
- Understand the components of marketing campaigns for live and media based productions, including advertising in both traditional and social media.
- Demonstrate understanding of the distribution component of both live and mediabased production including Web, print, radio, television, and communication based options.

GAME DESIGN & INTEGRATION PATHWAY (114)

Students who follow the Game Design and Integration pathway prepare for careers within the game design industry and in related technical fields. Students will develop foundational knowledge in game design, animation, graphics, and computer software and hardware. They will apply skills in Mathematics, Physics, English Language Arts, Social Science, and Entrepreneurship. Most importantly, students will learn the twenty-first century skills of creativity, critical thinking, communication, collaboration, and technical expertise, which will increase

employment capacity across the job market. In the Game Design and Integration Pathway students prepare for both entry-level employment and additional postsecondary training needed for advancement in the highly competitive game design industry. They prepare for occupations such as Game Tester/Analyst, 2-D and 3-D Animator, Storyboard, Level Artist, Texture Artist, Cinematic Artist, Game Designer, Game Programmer, and Production Team Manager. Students completing this pathway develop the skills and knowledge to be creative partners in video game design while building capacity for employment in all areas of the creative workforce.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Game Design & Integration Pathway Students Will:

- Demonstrate understanding of current trends and the historical significance of both electronic and non-electronic games.
- Students will analyze different game systems and identify how these systems have influenced consumer technology.
- Research and analyze different game genres, including multiplayer games.
- Define and use necessary vocabulary related to games, their genres, game platforms, and game hardware.
- Research, compare, and categorize different game platforms and game hardware.
- Analyze the technology transfer from video games to other industries, such as education, medical, corporate training, and military simulation.
- Present a mock-up of a future generation game platform and hardware system based on research of current and emerging technologies and future predictions.
- Analyze the core tasks and challenges of video game design and explore the methods used to create and sustain player immersion.
- Identify and define the roles and responsibilities of each member of a video game design team.
- Break down and identify the fundamental building blocks of game play: player goals, player actions, rewards, and challenges.
- Research various input controls and display types then identify how these impact game play.
- Research and define the term “player immersion.”
- Explore and explain the factors that create player immersion in a game.
- Compare and contrast player-centric design and designer-centric design in video games.
- Describe a designer-centric game to highlighting features other than game play and entertainment value.
- Prototype a small game using real-world objects, such as dice, cards, balls, pen and paper, etc.
- Acquire and apply appropriate game programming concepts and skills to develop a playable video game.
- Implement common programming concepts, including logic operators, conditional statements, loops, variables, events, actions, and handling user input.
- Understand the basics of game physics, including collision and motion.

- Examine the use of math and physics (such as gravity and friction) in game development.
- Explore the basics of random number generation.
- Implement a small video game utilizing mathematics and physics that features at least one moving object (such as a spaceship) which rotates along an axis and moves in whichever direction it is facing after rotation. The game must include collision physics.
- Students will demonstrate mastery of game art and multimedia, including music, sound, art, and animation.
- Demonstrate understanding of the elements of art, including line, shape, color, value, texture, space, and balance, to set the mood and feel of a scene.
- Research and describe the different perspectives used in video games, including first person, second person, and third person perspectives.
- Explain how to create the illusion of 3-D in a 2-D environment.
- Create 2-D art and 3-D models.
- Create an animation sequence.
- Design a game environment using lines, fills, and color to set a specific mood and feel of a scene.
- Create, record, and edit audio for a game.
- Define and discuss intellectual property, copyrights, trademarks, and piracy as they relate to art and multimedia assets in a game.
- Understand the basics of character design and development, world design, and level design.
- Create a storyboard for a game cut-scene applying the basic principles of design and concepts of cinematography.
- Demonstrate an understanding of testing techniques used to evaluate, assess, rate, and review quality assurance of video games.
- Test and analyze games to determine the quality of rules, interfaces, navigation, performance, and game play.
- Identify the key elements in a game and make intelligent judgments about whether the game succeeded or failed in its objectives.
- Compare and contrast the differences between functionality and usability of software.
- Evaluate games in terms of accessibility issues.
- Demonstrate technical reading and writing skills.
- Test a classmate's game project and create a bug report for the game. For each error submitted, write steps in sufficient detail so it is identifiable and reproducible to the developer. Use a metric to identify how critical the error is based on its negative impact on game play.
- Understand the general procedures, documentation, and requirements of large scale game design projects. Examine and categorize the significant processes in the production of games.
- Identify processes of design and development from concept to production, including content creation, filling team roles, design documentation, communication, and scheduling for video game design teams.
- Discuss the iterative nature of game and simulation design.
- Develop design plans, character sketches, documentation, and storyboards for proposed games.

- Enumerate individual tasks of a project using basic time management skills to complete each task and track its completion.
- Describe the importance and interrelationship between development schedule and budget constraints in a video game design project.
- Compare and contrast common uses of different game development tools.
- Create a set of original design documents and build a small game.
- Understand the fundamentals of business and marketing, including entrepreneurship, global marketing, and localization.
- Identify, define, and discuss the different ways games are funded, distributed, marketed, and sold.
- Identify and describe licensing management for different game platforms, tools, and intellectual properties.
- Identify successful business models and analyze various facets of those models, such as market analysis, marketing strategy, and product value. Understand the components of marketing campaigns for games, including advertising in traditional and social media.
- Understand the role community management plays in marketing and business models.
- Discuss the relationships between publishers, developers, distributors, marketers, and retailers.
- Evaluate game journalism and professional reviews in terms of bias.
- Explore and describe the effects of globalization on the design and production of video games.
- Evaluate how video games adhere to government rating systems.
- Create a plan for a game to target a specific audience within three different countries while adhering to their governments' rating systems.
- Understand the impact of games and the role of play in human culture. Analyze the ethics and global impact of the game industry.
- Discuss the word "play" and its many definitions.
- Investigate and discuss how play can help humans acquire knowledge and social skills.
- Describe the benefits of games and simulations, including online economies and community building.
- Compare and contrast the different opinions on the effects of games on behavior, cognitive development, and motor skills.
- Describe how frequent exposure and/or access to video games has reshaped the level of technical proficiency of our workforce.
- Explore and discuss the impact of video games on the economy.
- Design a game you believe will have positive impact on the world.
- Identify career goals and develop a career plan that explores employment opportunities in the video game industry.
- Demonstrate personal and interpersonal skills appropriate for the workplace, such as responsibility, dependability, punctuality, positive attitude, initiative, respect for self and others, and professional dress.
- Investigate how the skills acquired in game design/development can be applied to other industries.
- Use personal assessment tools to identify personal and professional strengths and weaknesses.

- Analyze job and career requirements as related to career interests and opportunities in the game industry.
- Investigate the common employment contracts in the game industry, such as Nondisclosure Agreements, “Work for Hire” agreements, and “Noncompete” clauses.
- Create a resume and use it during a mock interview. At the end of the interview process, apply negotiation skills as they relate to salary and benefits packages.
- Students will build a game that demonstrates teamwork and project management by creating a game design production plan that describes the game play, outcomes, controls, rewards, interface, and artistic style of a video game.
- Use design documents to create a game design production plan.
- Solicit and accept constructive criticism.
- Use computer tools to create game programming, art, and audio.
- Create and use animated objects in a game. D10.5 Create sound and music to enhance the game experience.
- Test and debug the completed game.
- Apply listening, speaking, and collaborative communication skills to effectively convey information.
- Demonstrate a professional level of written and oral communication as necessary in the game industry.

Building & Construction Trades

CABINETRY, MILLWORK, & WOODWORKING PATHWAY

The Cabinetry, Millwork, and Woodworking pathway provides learning opportunities for students interested in preparing for careers in cabinet construction, millwork, finish carpentry, and furniture making for both production and custom products.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Cabinetry, Millwork, & Woodworking Pathway Students Will:

- Demonstrate competence in planning, design, layout, and technical drawing interpretation for practical use in cabinetmaking and millworking.
- Identify common sizes in relation to furniture and cabinets.
- Describe the relationship between the function and form of a cabinet.
- Calculate board, square, and linear feet.
- Estimate material costs.
- Apply design elements: shapes, textures, lines, and colors to create functional and attractive cabinets, furniture, and millwork.

- Apply principles of design, harmony, repetitions, balance, and proportion to create functional and attractive cabinets, furniture, and millwork.
- Read and interpret technical drawings.
- Sketch a project using manual drawing techniques.
- Use drafting tools to create a pictorial and working drawing for a basic cabinet.
- Differentiate between the various furniture and cabinet styles used in the cabinet and furniture industry.
- Identify various cabinet styles and list characteristics of traditional, provincial, and contemporary designs.
- Identify various kitchen, bath, and utility cabinet components.
- Explain the progress of cabinetry and furniture styles from the seventeenth century to today.
- Interpret and apply information to develop a bill of materials, estimate the cost of materials, and develop a plan of procedures to complete a project.
- List the sequence of cutting procedures, assembly, and finishing steps.
- Evaluate an existing bill of materials for accuracy
- Determine the cost of materials needed for a cabinet or furniture project.
- Optimize available materials from a cutting diagram.
- Compare and contrast the cost of a specific project using different materials.
- Develop a materials list, cut list, and cost estimate from a working drawing for a specific cabinet project.
- Demonstrate proper selection and use of woodworking tools.
- Demonstrate the accurate use of common measuring and layout tools.
- Select the proper layout tools for specific tasks.
- Select the proper cutting tools for specific operations (e.g., straight cuts, curves, drilling holes).
- Select the most appropriate blade for a given operation.
- Select the proper boring tools for specific operations.
- Select the proper hand-shaping tools for specific operations.
- Select proper clamping tools for specific operations.
- Identify wood products and materials used in the furniture and cabinetmaking industry and describe their characteristics and uses.
- Define the difference between a hardwood and softwood.
- Identify several different species of hardwood and their characteristics that are common to the cabinetmaking and millwork industry.
- Identify several different species of softwood and their characteristics that are common to the cabinetmaking and millwork industry.
- Identify common defects found in wood and list possible solutions.
- Identify and be able to differentiate panel products and their uses in the cabinetmaking industry.
- Describe the cutting and handling techniques used for sheet goods.
- Compare and contrast the advantages and disadvantages of sheet goods versus solid wood stock.
- Identify standard sizes and grades of various laminates.
- Describe how the expansion and contraction of solid wood affects the design of joinery used in furniture and cabinet construction.

- Identify the proper adhesive required for applying laminate.
- Identify standard sizes and grades of various veneers.
- Identify the proper adhesive(s) required for applying veneers.
- Identify the different types of pattern matching in veneers.
- Compare and contrast the advantages and disadvantages of using laminates verses using veneers.
- Demonstrate a working knowledge of joinery, fasteners, and adhesives.
- Define the purposes for metallic fasteners in furniture and cabinetmaking.
- Select the proper metallic fasteners for specific applications.
- Demonstrate the proper use of metallic fasteners for specific applications.
- Compare and contrast joints commonly used in the cabinetmaking and millworking industries (i.e., strength, appearance, and ease of construction).
- Determine the appropriate application of a variety of joinery techniques, including dowels, biscuits, pocket holes, and mortise and tenon
- Identify characteristics of adhesives that affect the assembly time, cure time, and strength of the product.
- Select the proper adhesive(s) to construct wood joints used in furniture or cabinets.
- Demonstrate initial assembly and dry clamping procedures. A6.10 Demonstrate the proper use and application of adhesives.
- Demonstrate the proper cleanup procedures for specific adhesives.
- Select the correct type of wood joint used for a specific application and material.
- Demonstrate the ability to construct a variety of wood joints (i.e. butt, miter, compound miter, half lap, mortise and tenon).
- Demonstrate competence in various construction processes in the cabinetmaking, furniture making, and millworking industries.
- Square and surface a board to a specific size.
- Demonstrate common case construction.
- Demonstrate common frame and panel construction.
- Construct a case with a face frame using appropriate construction techniques.
- Construct a frameless case using appropriate construction techniques.
- Construct a cabinet drawer using appropriate construction techniques.
- Construct a cabinet door using appropriate construction techniques.
- Demonstrate the use of a jig, template, or fixture in a production project.
- Use appropriate methods and tools to check the accuracy of a project.
- Demonstrate the use of a mass production technique (i.e., parts duplication and assembly processes).
- Lay out, install, and adjust the appropriate drawer hardware to include drawer slides and pulls.
- Lay out, install, and adjust the appropriate door hardware to include European and standard hinges.
- Apply a plastic laminate to a surface using appropriate adhesive and trim to fit.
- Use the appropriate adhesives and fasteners to install different types of trim, moldings, or other edge treatments.
- Utilize appropriate abrasives to prepare a project for a specific finish.
- Select the proper abrasive for shaping and smoothing materials.
- Select the proper grit sizes and sequences for shaping and smoothing operations.

- Demonstrate proper selection, application, and cleaning methods for various types of filler materials.
- Properly prepare a surface for finishing.
- Understand finishes and when to apply paint, stains, sealers, varnishes, and catalyzed finishes, including water- and oil-based finishes.
- Demonstrate proper selection and application methods of different types of stains for a specific application.
- Demonstrate cleaning procedure for various types of stains.
- Select the proper type of sealer and finish coat for a specific application.
- Demonstrate proper application methods for different types of sealers and finish coats.
- Demonstrate cleaning procedures for various types of sealer and finish coats.
- Apply a suitable finish to a specific cabinet or millwork project.
- Demonstrate proper techniques for cabinet installation.
- Transport a project from one location to another without damage.
- Lay out a cabinet installation according to a floor plan.
- Create and adjust a layout to plumb, square, and level.
- Install a base and upper cabinet.
- Scribe a cabinet to fit a corner or against an irregular wall surface.
- Identify the advantages and disadvantages for various countertop materials.
- Identify a variety of materials used for kitchen and bath countertops and list their advantages and disadvantages.
- Describe the methods for attaching different countertops to a cabinet.
- Install of a variety of countertop materials using appropriate fastening methods.
- Use a cut-in template for the installation of sink, faucets, cooktop, and other fixtures

RESIDENTIAL & COMMERCIAL CONSTRUCTION PATHWAY

The Residential and Commercial Construction pathway provides learning opportunities for students interested in preparing for careers in construction and building design, performance, and sustainability. The standards focus on the manner in which residential and commercial structures are designed and built. The pathway includes instruction in the way in which these structures are built (Class B California License).

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Residential & Commercial Construction Pathway Students Will:

- Recognize the impact of financial, technical, environmental, and labor trends on the past and future of the construction industry.
- Understand significant historical trends in the construction industry.
- Understand the environmental regulations that influence residential and commercial design.

- Demonstrate knowledge of the California Environmental Quality Act (CEQA) and Environmental Impact Review (EIRs) impacts on residential and commercial construction.
- Apply the appropriate mathematical calculations used in the construction trades.
- Apply formulas to determine area, volume, lineal, board, and square feet.
- Apply the Pythagorean Theorem to calculate pipe offsets, roof slope, and check for square.
- Estimate the materials needed to complete a specific task.
- Determine the total developed length of the water supply piping system.
- Calculate the residual pressure at the highest outlet per the requirements of the Plumbing Code.
- Calculate the total fixture unit demand from the fixtures indicated on the construction drawings using the tables of the plumbing code.
- Calculate the proper slope for drain, waste and vent (DWV) piping.
- Apply Ohm's Law to calculate resistance, current flow, and voltage in series, parallel, and combination circuits.
- Calculate the load on an electrical system from general lighting and small and large appliances.
- Interpret and apply information from technical drawings, schedules, and specifications used in the construction trades.
- Identify the elements used in technical drawings, including types of lines, symbols, details, and views.
- Identify and interpret the elements of technical drawings, including plan, elevation, section, and detail views.
- Interpret technical drawings specifications.
- Identify plumbing, electrical, and mechanical symbols and other abbreviations used in construction drawings.
- Interpret and scale dimensions from a set of plans using an architect's scale.
- Interpret sectional and detail drawings to determine construction details such as corners, rough openings, stairs, and roof systems.
- Understand the sequencing and phases of residential and commercial construction projects.
- Demonstrate techniques for proper site preparation.
- Use leveling devices to check for elevation, level, and plumb.
- Demonstrate how to establish grades using survey instruments.
- Install batter boards.
- Check site layout for square using the diagonal method.
- Describe excavation and backfill methods.
- Identify different methods and equipment used for compaction.
- Identify types of backfill materials and how they are used.
- Demonstrate foundation layout techniques to include setting forms, placing reinforcements, and placing concrete according to construction drawings, specifications, and building codes.
- Describe the sequencing procedures for placing large and small slabs.
- Demonstrate how to establish elevations for concrete structures.

- Lay out location and elevation of concrete/masonry structures based on construction drawings.
- Develop a material take-off in accordance with construction drawings and specifications.
- Lay out location for reinforcements, expansion joints, openings, and embedded items based on construction drawings, specifications, and building codes.
- Construct, place, and brace forms for concrete as detailed in construction drawings for footings, slab, and raised floors.
- Place and secure reinforcement as detailed by construction drawings, building codes, and industry standards.
- Place secure embedded hardware as detailed on construction drawings.
- Demonstrate proper removal and care of concrete forms.
- Use appropriate tools and techniques for placing, compacting, screeding, and finishing consolidating concrete in slabs and footings.
- Demonstrate carpentry techniques for the construction of a single-family residence.
- Properly place a moisture barrier and pest control guard on a foundation.
- Attach a sill plate at top of concrete foundation.
- Lay out, cut, and install joist supports, rim joists, and floor joists as specified on construction plans.
- Install a subfloor.
- Demonstrate wall and plate layout, including rough openings.
- Measure, cut, and assemble wall components using appropriate tools and fasteners.
- Demonstrate the ability to square wall systems and install wall bracing and shear panels according to code.
- Stand, square, plumb, and brace walls. D6.9 Describe the applications and uses of metal stud framing.
- Lay out, cut, and install ceiling joists and common and jack rafters.
- Frame and erect shed and gable roof systems.
- Lay out and install trusses “on-center” with specified hardware.
- Install appropriate blocking, bracing, lookouts, fascia, and drip edge.
- Frame for roof penetrations and attic access.
- Apply roof sheathing and install appropriate flashings.
- Understand different roofing materials and methods of application.
- Demonstrate proper installation techniques of interior finish materials and protective finishes.
- Identify types and uses of wall finishing materials.
- Cut, fit, and install gypsum wallboard onto a framed wall using appropriate fasteners.
- Describe the finishes and textures for gypsum wallboard.
- Properly prepare walls to receive protective finishes.
- Apply finishes according to specifications and industry standards.
- Identify types and application of finish flooring materials.
- Install pre-hung interior doors.
- Install interior trim and case work.
- Demonstrate the application of exterior finish materials and protective finishes in building construction.
- Describe the installation procedures and techniques of masonry siding materials.
- Install wood, vinyl, and/or manufactured siding.

- Demonstrate preparation techniques for applying exterior paint and stain.
- Apply exterior paint and stain according to specifications.
- Describe various types and uses of doors and windows used in building construction.
- Install pre-hung windows and doors using appropriate flashing and trim.
- Caulk and seal joints to prevent air and moisture infiltration and increase energy efficiency.
- Install vents for efficient attic and crawl space ventilation.
- Install various types of floor, wall, and ceiling thermal insulation.
- Describe mold-prevention techniques.
- Understand, integrate, and employ sustainable construction practices in the building trades.
- Identify design and energy solutions for improving building energy efficiency.
- Identify materials used in building construction to increase energy efficiency and sustainability.
- Calculate energy requirements and loads for buildings and structures.
- Demonstrate the application of constructing materials intended to improve building efficiency and sustainability.
- Analyze and evaluate buildings for energy efficiency and performance.
- Develop solutions to improve building energy performance and efficiency.
- Demonstrate skills necessary to complete a plumbing system in a single-family residence in accordance with accepted industry standards.
- Demonstrate techniques for cutting, deburring, and joining metallic and nonmetallic water piping.
- Lay out and install hot and cold water piping to fixture locations as indicated on the construction documents.
- Perform pressure test of an installed piping system.
- Install fastened in-place fixture valves and shut-off valves as indicated on construction drawings.
- Install and secure proper drainage piping to fixture locations.
- Determine the proper slope for DWV piping using hand levels, laser levels, and transits.
- Install traps and vents as indicated by construction drawings, specifications, and government codes.
- Install angle stops at water supply stub outs.
- Install plumbing fixtures.
- Connect the water supply to faucets and water closets.
- Connect fixture tailpieces to fixtures and to traps.
- Check for the proper functioning of fixtures.
- Demonstrate skills necessary to complete an electrical system in a single-family residence in accordance with accepted industry standards.
- Determine whether or not an electrical circuit is “live.”
- Prepare rough framing for the installation of electrical cables and conduit.
- Lay out components to the tolerances indicated on the construction drawings, specifications, and government codes.
- Install typical devices, junction boxes, and panels.
- Install lighting and ceiling fan support boxes according to the National Electrical Code (NEC).

- Install conduit typical of residential construction and pull conductors through conduit as required by the NEC.
- Splice and tap conductors for the installation of fixtures and devices.
- Install low voltage control and communication cables.
- Demonstrate grounding techniques for all electrical boxes, cabinets, and enclosures.
- Terminate electrical connections to receptacles, switches, lighting fixtures, large appliances, and other devices.
- Select receptacles and switches based on load requirements.
- Terminate equipment grounding and neutral conductor at the electrical service.
- Terminate communication and control wiring.

Business & Finance

BUSINESS MANAGEMENT PATHWAY

Management consists of planning, leading, and controlling an organization or effort to accomplish a goal. In the Business Management pathway, students learn entrepreneurship and business fundamentals, goal-setting, resource allocation, organizational structure and management techniques, economics, financial data, risk management, information technology, and supply chain management.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Business Management Pathway Students Will:

- Explain entrepreneurship and the fundamentals of developing a new business.
- Recognize personal traits and leadership styles of entrepreneurs and business leaders.
- Analyze management theories and their application within the business environment.
- Develop personal management skills to function effectively, efficiently, and collaboratively in a business environment.
- Determine the type of business organization most appropriate for various business profiles.
- Construct and defend a business plan (components may include an executive summary, organizational structure, market analysis, Strengths Weaknesses Opportunities and Threats (SWOT) analysis, marketing plan, operating procedures, financial data, and feasibility and supporting documentation).
- Plan, organize, secure, and manage resources of a project to achieve specific goals.
- Determine Specific, Measurable, Achievable, Realistic and Time-bound (SMART) goals for a specific project.

- Develop a project schedule, including the constraints of cost, time, and scope, to illustrate project structure using Gantt, Program Evaluation Review Technique (PERT), or other project planning tools.
- Optimize allocation of resources necessary to achieve predefined objectives.
- Evaluate beneficial change, or added value, of a specific project.
- Investigate the functions and techniques of management and organizational structure and distinguish between small and large companies.
- Explain the organizational structure of various business environments.
- Describe management's role in demonstrating leadership, motivating employees, resolving conflict, addressing stress, and recognizing formal and informal employee groups.
- Recognize a business' responsibility to employees, shareholders, society, and the environment.
- Summarize techniques for managing human resources to maximize operational efficiencies and effectiveness.
- Describe the role of organized labor and its influence on government and businesses.
- Apply operations management principles and procedures to the design of an operations plan.
- Apply economic concepts as they relate to business.
- Identify factors of production needed to create wealth.
- Explain the role of business in a free-enterprise system.
- Recognize the determinants of supply and demand and their impact on pricing.
- Calculate productivity with various levels of input.
- Illustrate the business cycle elaborating on leading, coinciding, and lagging economic indicators.
- Show the relationship between economic conditions and financial markets, including exchange rates.
- Analyze financial data in order to make short-term and long-term decisions.
- Describe factors that affect the value of an asset, inflation, interest rates, risk, and return.
- Determine investment and finance options available at different stages of a business or product life cycle.
- Compare and interpret financial reports for internal and external use to analyze risk and return to make business decisions.
- Analyze how credit reports quantify credit worthiness.
- Assess how types of financial markets influence interest rates, inflation, balance of trade, and unemployment and the impact on business decisions.
- Create and use budgets to guide financial decision making.
- Explain the importance of risk management and regulatory compliance in business.
- Identify, assess, and prioritize risks.
- Describe the concept and process of risk management, including the use of risk management tools such as insurance.
- Compare and contrast the various types of taxes in terms of the business structure.
- Utilize information and technology tools to conduct business effectively and efficiently.
- Describe appropriate computer hardware used in business.
- Apply appropriate software used in business.

- Examine technological trends and analyze the impact of technological innovations on the marketing and distribution of goods and services.
- Integrate appropriate use of the Internet in business.
- Investigate data security systems for business.
- Construct a Marketing Plan.
- Describe effective marketing techniques.
- Explore how products and services are conceived, developed, maintained, and improved in response to market opportunities.
- Conduct market analysis and assess the business organization's position within their industry.
- Interpret how market research is used to develop strategies for marketing.
- Differentiate the components of a promotional plan (e.g., advertising, public relations, and sales promotion) and describe how the plan is used to achieve a stated outcome.
- Practice selling techniques used to aid customers and clients in making buying decisions.
- Apply principles of supply chain management and SCM 2.0 to a business model.
- Describe Logistics Management systems.
- Illustrate the management of the complete flow of materials and activities in the supply chain from suppliers to customers.
- Summarize materials management, including effective inventory management practices, E= Procurement, and continuous control practices.
- Create a master plan for resources that addresses market demand, sales, and operations planning.
- Change variables in a master plan for resources, analyze its effect, and recommend corrective actions.

Education, Child Development & Family Services

EDUCATION PATHWAY

The Education pathway is designed to prepare students for professional or learning support positions in education, prekindergarten through grade twelve. Students study human development; standards, regulations, and codes; positive guidance and counseling techniques; age-appropriate and gradeappropriate learning strategies; learning theories; and standards-based curriculum and instructional design. Students can apply and practice their knowledge and skills at a variety of elementary and secondary education sites.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Education Pathway Students Will:

- Describe the structure of the education industry and its role in local, state, and global economies.
- Identify the effect of the education industry on state and local economies.
- Describe the basic structure of public education in California (e.g., prekindergarten through grade twelve, community college, the California State University, the University of California), as well as private institutions.
- Understand the legislative, economic, and social trends that affect the education industry.
- Explain the differences in organizational structures at educational facilities, including relationships and interactions among personnel.
- Name operational procedures and organizational policies at various levels in education.
- Identify the business procedures related to the acquisition of supplies and collection of fees.
- Recognize the main workforce management strategies in education (e.g., shared responsibility and negotiation).
- Implement appropriate procedures at the classroom level (e.g., attendance; observations; evaluations; illness, incident, accident, and injury reports).
- State specific applications of government regulations in the education industry.
- Describe the critical health and safety procedures that are used at a school site.
- Identify the indicators of child abuse and neglect and the role of the mandated reporter.
- Locate and understand the credentialing requirements for teachers of students in prekindergarten through community college.
- Practice critical emergency and disaster procedures at a school site.
- Identify state and federal environmental and safety regulations and the use of Material Safety Data Sheets (MSDS) as they relate to the education industry.
- Recognize the typical hazards at the work site and know the procedures and practices that contribute to a safe and healthy environment.
- Describe the staff procedures, duties, and responsibilities related to safety, emergency, and disaster preparedness plans.
- Demonstrate how to use certified first aid, cardiopulmonary resuscitation (CPR), and other emergency procedures.
- Summarize important elements of the physical, intellectual, emotional, and social development of children and adolescents.
- Identify how typical and common atypical developmental patterns affect the educational progress of children and adolescents.
- Explain the role of family involvement in the physical, intellectual, emotional, and social development of children and adolescents.
- Diagram factors in heredity, family, culture, diversity, economic, abilities, and environment that may influence the development of children and adolescents.
- Assess and evaluate evidence-based educational practices for the inclusion of children and adolescents with special needs.
- Use positive interaction, guidance, and discipline in the educational environment.
- List common behavior problems, possible causes, and develop potential positive solutions.
- Define the types of positive guidance techniques that are used in various ages and stages of a child's development.

- Demonstrate how to support the development of a positive self-image and self-esteem as well as independence and respect for oneself and others.
- Practice strategies for building relationships and effective classroom management, including appropriate guidance and discipline. C6.5 Develop strategies for building relationships with all stakeholders.
- Explain the role and purpose of standards-based instruction and assessment.
- Identify relevant curriculum standards and demonstrate their use in instruction.
- Understand the processes, implementations, and educator responsibilities of individualized education programs (IEPs) and Section 504 plans of the Rehabilitation Act and the Americans with Disabilities Act
- Understand the types, important elements, and purposes of student assessments.
- Explain the process of assessment for early identification of remedial needs or other interventions.
- Use the basic components of effective standards-based lesson plans appropriate for varying ages, learning styles, and diverse cultural backgrounds and abilities to write lesson plans.
- Practice using teaching strategies that promote student learning, critical thinking, and problem solving.
- Identify relevant curriculum standards, their significance to student success, and demonstrate their use in instruction.
- Compare basic principles and practices of good nutrition and health and wellness for children.
- Describe crucial safety and sanitary procedures to follow in the classroom related to good nutrition and health.
- Identify services available to at-risk students and how to link students to resources.
- Apply appropriate sanitation, health, and hygiene procedures for preventing the spread of infections and illnesses and for responding to allergic reactions.
- Research the nutritional needs of children and the allergies commonly associated with food.
- Detect common indicators of nutrition-related disorders and diseases.
- Assess how to communicate and interact effectively with families and community groups.
- Recognize the factors that influence effective communication between the school and home and how to foster familial involvement.
- Summarize the ways in which age, abilities, language, culture, economics, and educational backgrounds may affect communication within and among families and the school.
- Explain issues of diversity and how to exhibit sensitivity to cultural differences.
- Integrate the process of developing quality teaching materials and resources for classroom instruction.
- Evaluate various types and sources of quality, developmentally appropriate materials and equipment.
- Demonstrate the appropriate use of current and emerging technology to develop instructional materials and support learning.
- Assess available materials and resources for quality, accuracy, relevance, and grade appropriateness.

- Design grade-appropriate instructional materials and resources, including those that augment educational materials adopted by the State Board of Education.
- Evaluate the role of instructional staff in supporting the learning process.
- Name behavior standards expected of students in classrooms, libraries, and bathrooms on the school grounds and during educational and recreational trips.
- Demonstrate techniques for providing positive feedback on student work, attendance, and classroom performance.
- Explain how to help the teacher with student instruction, assessment, and confidentiality.
- Analyze a variety of individual and group teaching strategies and learning theories that promote effective learning.
- Research the common typical and atypical learning challenges for students in a variety of curricular areas.
- Formulate the components of effective after-school and recreational programs for individuals and groups.
- List the purposes of after-school and recreational activities.
- Summarize the important components and typical age-appropriate or ability-appropriate activities of various after-school and recreational programs.
- Assess the recreational interests and needs of individuals and groups and develop appropriate activities.

Energy, Environment, & Utilities

ENVIRONMENTAL RESOURCES PATHWAY

The Environmental Resources pathway prepares students for employment, postsecondary education, and/or training in a variety of environmental industries.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Environmental Resources Pathway Students Will:

- Identify energy resources and the effects of these resources on the environment.
- Classify energy resources by type: depletable, nondepletable, renewable, and nonrenewable.
- Discover new and emerging energy resources.
- Compare the advantages and disadvantages of energy resources in terms of the effects on the environment.
- List jobs in the community that result from, or are influenced by, processing and using energy resources.
- Identify and describe the global interactive systems and elements that create and sustain climate.
- Describe the natural elements that interact to create climate.

- Identify world climate patterns and summarize factors that affect climate.
- Analyze the impact of climate upon human activities and needs.
- Identify the greenhouse effect and climate change.
- Explain how greenhouse gases are generated.
- Assess impacts of greenhouse gases on the environment.
- Evaluate regional interactive systems and elements that create harmful environmental effects.
- Describe the sources of, and impacts attributable to, pollution and contamination.
- Recognize the actions that cause resource depletion.
- Define the causes of erosion and soil depletion.
- Describe the attributes and proliferation of hardscape.
- Identify the sources of, and impacts attributable to, habitat alteration.
- Research the environmental implications of energy conversion processes and energy transmission systems.
- Define the basic terms, characteristics, and concepts of physical and chemical processes related to energy conversion.
- Identify the basic principles of energy systems, including chemical, hydraulic, pneumatic, electrical, nuclear, solar, wind, and geothermal.
- Analyze the impacts of energy conversion processes as they relate to activities across the environment.
- Identify the role and impact of waste management systems and their operations on the environment.
- Understand the role of waste and storm water management systems, their operation, and their impact on the environment.
- Explore the causes and effects of pollution linked to wastewater treatment facilities.
- Identify wastewater treatment processes that lessen environmental impacts and improve water reuse.
- Explain the types and sources of hazardous waste and associated safety practices and legal requirements for handling and disposing of such waste.
- Design solid waste disposal processes that lessen environmental impacts and improve recycling.
- Understand the field of land use management and its potential for environmental impact.
- Describe the need for, and role of, habitat preservation.
- Describe the composition, role, and function of ecosystems, including trends affecting viability.
- Demonstrate the need for, and methods of, land use planning.
- Identify the aspects of land use planning and describe current trends.
- Summarize the relationship between land use planning and energy use and distribution.
- Explain the laws and regulations pertaining to land use planning.
- Develop strategies to maximize the effectiveness of land use planning.
- Research the role of air quality management and systems, their operations, and their impact on the environment.
- Understand the elements that create outdoor air quality.
- Summarize the causes of air pollutants and their chemical composition.
- Research air pollutants and their threat to human health.

- Understand U.S. and California laws and regulations related to air pollution control programs and health effects of air pollution.
- Describe the basic U.S. Environmental Protection Agency (EPA) and California Air Resources Board (ARB) roles and regulations.
- Implement processes to support energy efficiency.
- Understand the relationship between power and energy efficiency.
- Outline how domestic and industrial appliances and systems affect the environment, such as water units and heating and cooling systems.
- Compare costs of alternate/renewable energy sources, systems, and appliances and traditional energy sources, systems, and appliances.
- Conduct an energy audit.
- Research drinking-water sources, systems, treatment, and conservation.
- Understand water reuse: issues, strategies, technologies, and applications.
- Analyze strategies for improving energy efficiencies in water collection and distribution.
- Describe the role of environmental engineering and green energy in water systems.
- Understand the functions and operations of water storage, reservoirs, aqueducts, and dams.
- Evaluate the impact and flow management of storm water, rivers, and groundwater.
- Understand the designs and tools used in water flow management.
- Describe watershed modeling.
- Understand the principles and applications of drainage engineering.
- Use the Hydrologic Engineering Centers River Analysis System (HEC-RAS).
- Analyze and interpret contaminated harbor and river sediment.
- Describe the concerns and strategies for catastrophic storm water events and management.
- Prepare an efficient solar heated water design and installation plan.
- Identify the characteristics of solar heated water design and installation.
- Describe the requirements of solar water heaters that meet regulations.
- Describe solar hot water financial support programs and regulations.
- Analyze efficient solar water heating systems.
- Identify and analyze issues, legislation, and regulations related to energy and the environment.
- Identify and discuss major environmental laws and policies, including the regulatory and legislative processes used to create such laws.
- Understand current regulations concerning recycling, solid waste, land use management, water quality, and renewable and nonrenewable energy.
- Compare and contrast environmental laws and regulations that may have a positive or negative impact on the environment and the economy.
- Create an environmental law or regulation and explain how it will impact the environment.

Engineering & Architecture

ARCHITECTURAL DESIGN PATHWAY

The Architectural Design pathway provides learning opportunities for students interested in preparing for careers in such areas as architecture, industrial design, and civil engineering.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Architectural Design Pathway Students Will:

- Understand how history shaped architecture and know significant events in the history of architectural design.
- Know significant historical architectural projects and their effects on society.
- Understand the development of architectural systems in relation to aesthetics, efficiency, and safety.
- Compare the theoretical, practical, and contextual issues that influence design.
- Describe the influence of community context and zoning requirements on architectural design.
- Understand the ways in which sociocultural conditions and issues influence architectural design.
- Compare the theoretical and practical effects of human and physical factors on the development of architectural designs.
- Analyze project design and compile a cost analysis.
- Understand the sketching processes used in concept development.
- Apply sketching techniques to a variety of architectural models.
- Produce proportional two- and three-dimensional sketches and designs.
- Present conceptual ideas, analysis, and design concepts using freehand graphic communication techniques.
- Understand the use of computer-aided drafting (CAD) in developing architectural designs.
- Develop a preliminary architectural proposal using CAD software.
- Analyze viability of a project as the design is developed using Building Information Modeling (BIM).
- Compare the relationship between architecture and the external environment.
- Understand the significance of sustainable building design practices that incorporate beneficial energy and environmental design policies.
- Develop a site analysis that considers passive energy techniques, sustainability issues, and landscaping.
- Create a building design that incorporates passive and/or active energy-efficient technologies.
- Understand methods used to analyze simple structures.

- Understand load transfer mechanisms. A6.2 Understand stress-strain relationships of building structures.
- Interpret structural design considerations, including load-bearing relationships of shear walls, columns, and beams.
- Design a simple structure by using structural analysis principles.
- Understand the properties of structural materials.
- Understand the integration of architectural factors, such as soil mechanics, foundation design, engineering materials, and structure design.
- Develop a stress analysis chart of typical structural components.
- Evaluate available building materials (e.g., steel, concrete, and wood) by considering their properties and their effect on building form.
- Develop a preliminary building plan using the appropriate materials.
- Systematically complete an architectural project.
- Describe the various components of structures, including lighting; heating, ventilating, and air-conditioning (HVAC); mechanical; electrical; plumbing; communication; security; and vertical transportation systems.
- Develop a preliminary proposal for presentation of an architectural design.
- Read and interpret architectural and construction plans, drawings, diagrams, and specifications.
- Develop a complete set of architectural plans and drawings.
- Estimate the materials needed for a project by reading an architectural drawing.
- Plan a project using site and building restrictions imposed by various entities (e.g., Planning, Zoning, Building, and Home Owners Association [HOA]).
- Plan the sequence of events leading to an architectural project.
- Using various methods create both written and digital portfolios to represent architectural renderings.
- Develop a binder or digital portfolio representative of completed work for presentation.
- Prepare an effective oral presentation of the portfolio content.

ENGINEERING DESIGN PATHWAY

The Engineering Design pathway provides learning opportunities for students interested in preparing for careers in the design and production of mechanical, electrical, and computer systems.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Engineering Design Pathway Students Will::

- Understand historical and current events related to engineering design and their effects on society.
- Know historical and current events that have relevance to engineering design.
- Interpret the development of graphic language in relation to engineering design.

- Understand the effective use of engineering design equipment.
- Employ engineering design equipment using the appropriate methods and techniques.
- Apply conventional engineering design equipment procedures accurately, appropriately, and safely.
- Apply the concepts of engineering design to the tools, equipment, projects, and procedures of the Engineering Design Pathway.
- Understand the sketching process used in concept development.
- Apply sketching techniques to a variety of architectural models.
- Produce proportional two- and three-dimensional sketches and designs.
- Present conceptual ideas, analysis, and design concepts using freehand, graphic, communication techniques.
- Understand measurement systems as they apply to engineering design.
- Know how the various measurement systems are used in engineering drawings.
- Understand the degree of accuracy necessary for engineering design.
- Use proper projection techniques to develop orthographic drawings.
- Understand the concepts and procedures necessary for producing drawings.
- Develop multiview drawings using the orthographic projection process.
- Understand the various techniques for viewing objects.
- Use the concepts of geometric construction in the development of design drawings.
- Apply pictorial drawings derived from orthographic multiview drawings and sketches.
- Understand the function of sectional views.
- Clarify hidden features of an object using a sectional view and appropriate cutting planes.
- Understand the applications and functions of auxiliary views.
- Understand the function of auxiliary views.
- Use auxiliary views to clarify the true shape and size of an object.
- Understand and apply proper dimensioning standards to drawings.
- Know a variety of drafting applications and understand the proper dimensioning standards for each.
- Apply dimension to various objects and features.
- Understand the tolerance relationships between mating parts.
- Understand what constitutes mating parts in engineering design.
- Interpret geometric tolerancing symbols in a drawing.
- Use tolerancing in an engineering drawing.
- Understand the methods of applying text to a drawing.
- Describe the processes of lettering and/or text editing.
- Implement standard methods of title block creation and use.
- Develop drawings using notes and specifications.
- Plan, prepare, and interpret drawings and models through traditional drafting or computer-aided design (CAD) techniques.
- Understand the methods of creating both written and digital portfolios.
- Develop a binder or digital portfolio representative of completed work for presentation.
- Give an effective oral presentation of a portfolio.

Fashion & Interior Design

FASHION DESIGN & MERCHANDISING PATHWAY

The Fashion Design and Merchandising pathway focuses on the major aspects of the fashion industry and prepares students for careers and/or postsecondary education in this rapidly growing field. Students pursuing this career pathway have in-depth, hands-on experiences that focus on industry awareness, sustainable practices, elements and principles of design, history of fashion, fashion forecasting, textiles and textile products, product knowledge, apparel merchandising, and garment production.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Fashion Design & Merchandising Pathway Students Will:

- Understand various aspects of the fashion design, manufacturing, merchandising, and retail industry and the industry's role in local, state, national, and global economies.
- Understand the different segments of the fashion industry from textile design to retail sales.
- Identify how the various segments of the industry contribute to local, state, national, and international economies.
- Understand how such resources as periodicals, mass media, trend reports, and the Internet are used in the industry.
- Compare major legislative, economic, and social trends that affect the industry.
- Research various professional organizations such as Fashion Group International (FGI) and National Retail Federation (NRF).
- Research postsecondary education options in the field of fashion design and merchandising.
- Understand basic hiring practices, operational policies, procedures, and regulatory requirements in the fashion design, manufacturing, merchandising, and retail industry.
- Identify what constitutes appropriate professional clothing, grooming, and personal hygiene for a variety of professions.
- Identify hiring practices within the industry.
- Analyze basic operational procedures for all aspects of the industry (e.g., quality control, inventory control, distribution, quick response marketing, production, and accounting).
- Create a product which assesses the importance of accurate and thorough documentation to various aspects of the industry.
- Understand the principles of organizational management, including the roles and responsibilities of management and employees.
- Describe important management strategies, such as shared responsibilities and negotiation.
- Practice using common organizational procedures and tools, such as business plans, spreadsheets, recordkeeping, and communication with consumers.

- Compare and contrast the major outcomes of effective management, such as profitability, productivity, a positive work environment, and client satisfaction.
- Identify and list management titles and the role of each position in the overall operation of the company.
- Use the concepts and principles that lead to a healthy business with a positive company culture to begin creating a business plan.
- Apply the elements and principles of design in various aspects of the fashion industry.
- Apply the elements and principles of design to various tasks within the fashion industry (e.g., textiles design, fashion design, graphic design, visual merchandising).
- Explain the fundamentals of trend forecasting.
- Integrate various types of technology in the design process.
- Master skills to create presentation boards.
- Create a portfolio to showcase design ideas and mastery.
- Understand how the history of social, cultural, political, economic, and technological changes influence fashion.
- Analyze how fashion and design have been influenced by politics, society, economics, culture, and aesthetics.
- Compare how textiles and design have evolved throughout history.
- Define the ways in which economies, mass production, labor unions, globalization, and technology affect the fashion industry.
- Create a product describing fashion cycles and the adaptation of historical fashions to current trends.
- Understand the characteristics, production, and maintenance of textiles and the use of sustainable practices.
- Identify general characteristics and maintenance of various fibers, fabrics, and finishes.
- Compare textile manufacturing methods for producing fabrics that are woven, nonwoven, and knit.
- Analyze principals of standard print design (e.g., abstract and geometric) and color designs (e.g., tone-on-tone, positive/negative, and monotone).
- Integrate the skills and procedures necessary to create and produce textile products.
- Research how technology is used to create various textiles.
- Evaluate how copyright, trademark, and patent laws affect textile design and production.
- Compile textile industry standards that demonstrate sustainable practices.
- Understand how trends, color, and societal forecasting are used in the fashion industry.
- Identify the resources available to the fashion industry that provide information on fashion trends, color, and societal trend forecasting.
- Research trends that influence fashion and interior design.
- Apply trend forecasting as it relates to fashion design, textile design, product development, and merchandising.
- Understand the principles and techniques used in fashion design and product development and manufacturing.
- Know the basic process of manufacturing garments.
- Identify equipment, tools, supplies, and software to construct or manufacture garments.
- Illustrate how the manufacturing process relates to the cost of producing garments.
- Evaluate the effects of global sourcing on garment production.

- Formulate cost sheets for garments, including manufacturer's costs, markup, and profit margin.
- Sketch a fashion design on the nine-head figure.
- Define flat patternmaking and draping techniques.
- Recognize pattern specifications for global production.
- Experiment with draping using various fabrics.
- Distinguish how technology is used in patternmaking, grading, and marking.
- Evaluate first-sample garments made from first patterns and make necessary adjustments.
- Understand the skills and procedures necessary for sales, marketing, and branding in the fashion industry.
- Define basic procedures for sales, exchanges, and returns.
- Identify the factors that contribute to quality customer relations, service, and sales.
- Analyze customer buying motives.
- Apply effective sales, marketing techniques, and presentation skills.
- Assess strategies for helping customers select merchandise and recommend related products and services appropriate to their needs.
- Explain how technology can be used to provide customer service.
- Define the concept of branding and identify successful examples.
- Understand visual merchandising and product styling.
- Explain the characteristics of effective interior and exterior retail displays.
- Understand the theory and practice of merchandise placement on a sales floor.
- Construct store displays by using various fixtures (e.g., mannequins, shadow boxes, wall and tabletop displays, and props) to convey specific messages (e.g., a store's image, a specific manufacturer's label, a color or fabric story, or a specific event).
- Demonstrate understanding of methods of visual merchandising and styling as it relates to selling on all types of media by creating a marketing plan.
- Understand the current laws, work site policies, and systems for inventory control and loss prevention.
- Describe the procedures involved in receiving, inspecting, and marking merchandise and distributing it to the selling floor.
- Explain the role of inter-store transfers in the general distribution of goods.
- Understand the current laws that affect inventories.
- Compare common inventory loss points and strategies for loss prevention.
- Analyze how loss prevention affects all profits.
- Understand important aspects of the beauty industry.
- Identify and list various careers in the beauty industry.
- Compare how cosmetic products are made.
- Compare how products are regulated.
- Explain the training required for selling beauty products.
- Research various techniques for marketing beauty products.
- Create a product which demonstrates the principles of packaging beauty products.

Health, Science, & Medical Technology

BIOTECHNOLOGY PATHWAY

The standards for the applications of the Biotechnology pathway relate to occupations and functions relevant for understanding and solving biomedical problems and creating products to improve the quality of human life. The standards represent knowledge and skills necessary to succeed in diverse careers in this pathway.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Biotechnology Pathway Students Will:

- Define and assess biotechnology and recognize the diverse applications and impact on society.
- Use data to explain how biotechnology fields such as pharmaceuticals, agriculture, diagnostics, industrial products, instrumentation, and research and development are impacting human life.
- Describe the use of model organisms in biotechnology research and manufacturing.
- Recognize the role of innovation in creation of emerging biotechnology careers, including those in nanotechnology, biofuels, and forensics.
- Research and identify public misunderstandings related to biotechnology and discern the source of these misunderstandings.
- Evaluate the impact of biotechnological applications on both developing and industrial societies, including legal and judicial practices.
- Explore and outline the various science and non-science fields and careers associated with biotechnology.
- Understand the ethical, moral, legal, and cultural issues related to the use of biotechnology research and product development.
- Know the relationship between morality and ethics in the development of biotechnology health care products.
- Know the difference between personal, professional, and organizational ethics.
- Understand the necessity for accurate documentation and record keeping.
- Understand the critical need for ethical policies and procedures for institutions engaged in biotechnology research and product development.
- Describe the dilemma of health care costs related to advancements in biotechnology and public access to treatments.
- Prepare a presentation comparing the benefits and harm that can be the result of biotechnology innovations in both the research and application phases and which course of action will result in the best outcomes.
- Demonstrate competencies in the fundamentals of molecular cell biology, including deoxyribonucleic acid (DNA) and proteins and standard techniques for their purification and manipulation.

- Define and describe the structure and function of DNA ribonucleic acid (RNA) and proteins, explain the consequences of DNA mutations on proteins.
- Describe enzyme structure and function, diagram the impact of enzymes and catalysis on reaction rates, and recognize the emerging role of enzymes in replacing industrial chemicals.
- Employ standard techniques of DNA extraction, purification, restriction digests, bacterial cell culture, and agarose gel electrophoresis and document and evaluate results.
- Employ standard protein techniques, including antibody production, enzyme assays, spectrophotometry, gel electrophoresis, and chromatography and document and evaluate results.
- Predict outcomes of DNA and protein separation protocols.
- Recognize basic concepts in cell biology and become familiar with the laboratory tools used for their analysis.
- List and describe the structure and function of cellular organelle.
- Describe conditions that promote cell growth under aseptic conditions in the laboratory and workplace.
- Use various methods to monitor the growth of cell cultures.
- Explain the basic concepts of cell growth and reproduction, DNA replication, mitosis, meiosis, and protein synthesis.
- Discuss the structure and function of the macromolecules that compose cells, including carbohydrates, lipids, DNA, RNA, and protein molecules.
- Distinguish between prokaryotic cells, eukaryotic cells, and viruses.
- Conduct indicator tests for the common macromolecules of the cell.
- Integrate computer skills into program components.
- Use the Internet and World Wide Web to collect and share scientific information.
- Use a variety of methods, including literature searches in libraries, computer databases, and online for gathering background information, making observations, and collecting and organizing data.
- Compile labs (results, tables, graphs) in a legal scientific notebook and/or an Internet site or Web page.
- Implement use of the metric system, orders of magnitude, and the pH scale in preparation of reagents, analysis of data, and graphing.
- Apply knowledge of symbols, algebra, and statistics to graphical data presentation
- Prepare solutions based on both percent and weight composition to demonstrate proficiency in use of mechanical and digital microbalances.
- Calculate and prepare solutions of various molarity; calculate and prepare buffers of various pH; and prepare serial dilutions.
- Create data tables and graphs using Excel for the purpose of collecting and analyzing data.
- Understand the function of regulatory agencies for the biotechnology industry and the lasting impact of routine laboratory and communication practices on product development and manufacturing.
- Identify agencies at the local, state, and federal levels.
- Be aware of the role of agencies in promoting patient safety, quality control, and entrepreneurship.
- Describe intellectual property.

- Understand a patent and use online resources to search a patent database.
- Demonstrate accurate record keeping and follow good laboratory practice (GLP) for lab notebooks.
- Articulate issues of ethical concern, including plagiarism, copyrights, trademarks, and patents and use online data resources and searchable databases to investigate a copyright, trademark, or patent.
- Follow sustainable and safe practices with high regard for quality control.
- Follow written protocols and oral directions to perform a variety of laboratory and technical tasks.
- Recognize laboratory safety hazards using safe practices to avoid accidents.
- Locate and use Material Safety Data Sheets (MSDS).
- Outline the appropriate responses to a laboratory accident including identification of location and use of emergency equipment.
- Practice laboratory and personal safety including the location and use of emergency equipment (personal protective equipment, no food or drink, no open-toe shoes).
- Properly and safely use and monitor a variety of scientific equipment, including pH meters, microscopes, spectrophotometers, pipets, micropipets, and balances.
- Determine which equipment is appropriate to use for a given task and the units of measurement used.
- Perform specimen collection, label samples, and prepare samples for testing.
- Handle, transport, and store samples safely.
- Understand that manufacturing represents inter-connectedness between science and production.
- Describe the major steps of a product's move through a company's product pipeline.
- Identify several products obtained through recombinant DNA technology.
- Outline the steps in production and delivery of a product made through recombinant DNA technology.
- Cite examples of plant parts or extracts used as pharmaceuticals.
- Use the Internet to find information about traditional pharmaceuticals, herbal remedies, and recombinant pharmaceuticals.
- Evaluate the impact of robotics and automation on aseptic processes.
- Design a flow chart describing the steps for creating a new drug from hypothesis to distribution.

PATIENT CARE PATHWAY

The standards for the Patient Care pathway apply to occupations or functions involved in the prevention, treatment, and management of illness and the preservation of mental and physical well-being through the services offered by the medical and allied health professions. The standards specify the knowledge and skills needed by professional and technical personnel pursuing careers in this pathway.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content

Pathway Completer students have mastered the content

Patient Care Pathway Students Will:

- Recognize the integrated systems approach to health care delivery services: prevention, diagnosis, pathology, and treatment
- Know relationship and use of an integrated health care delivery system.
- Understand the range between prevention, diagnosis, pathology, and treatment procedures.
- Understand the significance of nontraditional approaches to health care in relationship to delivery systems.
- Illustrate the value of preventive and early intervention in relationship to health care practices.
- Describe the importance of reimbursement systems in relationship to the delivery of patient care.
- Understand the basic structure and function of the human body and relate normal function to common disorders.
- Know basic human body structure and function in relationship to specific care between prevention, diagnosis, pathology, and treatment.
- Describe basic stages of growth and development.
- Recognize common disease and disorders of the human body.
- Compare normal function of the human body to the diagnosis and treatment of disease and disorders.
- Know how to apply mathematical computations used in health care delivery system.
- Apply mathematical computations related to health care procedures (metric and household, conversions and measurements).
- Analyze diagrams, charts, graphs, and tables to interpret health care results.
- Record time using the 24-hour clock.
- Recognize and practice components of an intake assessment relevant to patient care.
- Conduct basic interview to acquire new knowledge (e.g., medical and family histories).
- Identify and summarize major life events as they impact health care practices and patient outcomes.
- Observe patient actions, interests, and behaviors while documenting responses. B4.4 Collect and synthesize information or data about the patient's symptoms and vital signs.
- Evaluate information gathered and connect patient data to appropriate system of care.
- Know the definition, spelling, pronunciation, and use of appropriate terminology in the health care setting.
- Use medical terminology in patient care appropriate to communicate information and observations.
- Accurately spell and define occupationally specific terms related to health care.
- Use roots, prefixes, and suffixes to communicate information.
- Use medical abbreviations to communicate information.
- Know the basic structure of medical terms.
- Demonstrate the correct pronunciation of medical terms.
- Practice word building medical terminology skills.

- Communicate procedures and goals to patients using various communication strategies to respond to questions and concerns.
- Observe and document the ability of patients to comprehend and understand procedures and determine how to adjust communication techniques.
- Use active listening skills (e.g., reflection, restatement, and clarification) and communication techniques to gather information from the patient.
- Formulate appropriate responses to address the patients concerns and questions in a positive manner.
- Employ sensitivity and withhold bias when communicating with patients.
- Report patient's progress and response to treatment goals.
- Maintain written guidelines of the Health Insurance Portability and Accountability Act (HIPAA) in all communications.
- Apply observation techniques to detect changes in the health status of patients.
- Demonstrate observation techniques.
- Differentiate between normal and abnormal patient health status.
- Document the patient findings and report information appropriately.
- Plan basic care procedures within the scope of practice to assist with patient comfort.
- Demonstrate the principles of body mechanics as they apply to the positioning, transferring, and transporting of patients.
- Explain the principles of body mechanics.
- Determine appropriate equipment for transportation and transfer, including the modification of equipment and techniques to accommodate the health status of the patient.
- Demonstrate appropriate transport and transfer methods to accommodate the health status of the patient.
- Evaluate equipment for possible hazards.
- Integrate proper body mechanics, ergonomics, safety equipment, and techniques to prevent personal injury to patients and clients.
- Implement wellness strategies for the prevention of injury and disease.
- Know and implement practices to prevent injury and protect health for self and others.
- Determine effective health and wellness routines for health care workers (i.e., stress management, hygiene, diet, rest, and drug use).
- Identify practices to prevent injuries and protect health, for self and others (i.e., seatbelts, helmets, and body mechanics).
- Know how to access available wellness services (i.e., screening, exams, and immunizations).
- Identify alternative/complementary health practices as used for injury and disease prevention.
- Explore consequences of not utilizing available wellness services and behaviors that prevent injury and illness.
- Comply with protocols and preventative health practices necessary to maintain a safe and healthy environment for patients, health care workers, coworkers, and self within the health care setting.
- Describe the infection control cycle with consideration of the various types of microorganisms.

- Demonstrate use of facility policies and procedures of infection control while performing patient care.
- Evaluate potential causes and methods of transmitting infections and how to apply standard precautionary guidelines.
- Demonstrate the use of appropriate personal protective equipment (PPE).
- Practice proper hand hygiene.
- Use various manual and mechanical decontamination and sterilization techniques and procedures.
- Document and analyze sanitation and infection control procedures.
- Comply with hazardous waste disposal policies and procedures, including documentation, to ensure that regulated waste is handled, packaged, stored, and disposed of in accordance with federal, state, and local regulations.
- Describe basic emergency procedures used to respond to a hazardous spill.
- Explain how waste is handled, packaged, stored, and disposed of in accordance with federal, state, and local regulations including hazardous chemicals, biohazards, and radioactive materials.
- Adhere to the health care setting's waste management program (e.g., recycling and reduction of regulated medical, solid, hazardous, chemical, and radioactive waste materials).
- Apply protective practices and procedure for airborne and blood-borne pathogens for equipment and facilities and identify unsafe conditions for corrective action. B12.0
- Adhere to the roles and responsibilities, within the scope of practice, that contribute to the design and implementation of treatment planning.
- Understand scope of practice and related skills within prevention, diagnosis, pathology, and treatment occupations.
- Describe the various roles and responsibilities of health care workers as team members in an integrated health care delivery system
- Demonstrate the knowledge and delivery of specific skills and procedures as outlined within the scope of practice appropriate for patient care in prevention, diagnosis, pathology, and treatment.
- Follow appropriate guidelines for implementation of various procedures.
- Research factors that define cultural differences between and among different ethnic, racial, and cultural groups and special populations.
- Utilize culturally appropriate community resources.
- Recognize complementary and alternative medicine as practiced within various cultures.
- Develop ethnographic skills, by location and information retrieval, carefully observe social behavior, and manage stress and time.
- Ask questions and explore aspects of global significance.
- Analyze data using relevant concepts.
- Know when and how to incorporate trained interpreters to facilitate communication and improve patient outcomes.

Hospitality, Tourism, & Recreation

FOOD SERVICE & HOSPITALITY PATHWAY

The Food Service and Hospitality pathway focuses on the key aspects of the industry. Students pursuing this career pathway have in-depth, hands-on experiences that emphasize industry awareness; sanitation and safe food handling; food and beverage production; nutrition; food service management; and customer service.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Hospitality, Tourism, & Recreation Students Will:

- Demonstrate an understanding of major aspects of the food service and hospitality industry and the role of the industry in local, state, national, and global economies.
- Define and compare core elements of the food service and hospitality industry from various supporting industries.
- Understand how the various segments of the industry contribute to, and impact, local, state, national, and international economies, cultures, and the environment.
- Explain the relationship between industry trends and local, state, national, and international economic trends.
- Research the advantages and disadvantages of the working conditions of various careers in the food service and hospitality industry.
- Demonstrate the basics of safe work habits, security, and emergency procedures required in food service and hospitality establishments.
- Identify the causes, prevention, and treatment of common accidents and the reporting procedures involved.
- Practice the basic procedures for the safety of employees and guests, including the procedures for emergency situations.
- Understand the role of the California Occupational Safety and Health Administration, the Environmental Protection Agency, and other agencies in regulating practices in the food service and hospitality industry.
- Understand the source and purpose of information in the Material Safety Data Sheets (MSDS) and know the proper use of personal protective equipment (PPE).
- Interpret the basic principles of sanitation and safe food handling.
- Employ the standards of personal grooming and hygiene required by local, state, and federal health and safety codes.
- Understand basic local, state, and federal sanitation regulations as they pertain to food production and service.
- Explain the types of food contamination, the potential causes, including cross contamination, and methods of prevention.
- Practice safe and sanitary procedures in all food handling, including food receiving, storage, production, service, and cleanup.

- Understand the essential principles of Hazard Analysis Critical Control Points, including the use of flowcharts.
- Understand the purpose and process of required industry certification (e.g., ServSafe, California Food Handlers Card).
- Analyze the basics of food service and hospitality management.
- Understand the responsibilities of management, such as ensuring safe work practices and conditions and complying with important laws and regulations that affect employment, such as wage and hour laws, tenant status, and accommodation of minors.
- Understand the importance of specific human resource practices and procedures that address workplace diversity, harassment, personal safety, and discrimination.
- Interpret the differences in goals and organizational management of various food service businesses.
- Understand the relationship of effective management and business procedures to important outcomes, such as profitability, productivity, workplace atmosphere, consumer and guest satisfaction, and business growth.
- Design and interpret business plans including: the mission, vision, target market, location, financing, and the community and ecological context of the business.
- Demonstrate an understanding of the basics of systems operations and the importance of maintaining facilities, equipment, tools, and supplies.
- Apply the procedures for cleaning and maintaining facilities and equipment and the importance of preventive maintenance and the use of nontoxic and less toxic materials.
- Recognize the types of materials and supplies used in the maintenance of facilities, including the identification of the hazardous environmental and physical properties of chemicals and the use of Material Safety Data Sheets (MSDS).
- Practice the procedures for maintaining inventories: ordering food, equipment, and supplies; and storing and restocking supplies.
- Understand the relationship between facilities management and profit and loss, including the costs of resource consumption, breakage, theft, supplies use, and decisions for repairs or replacement.
- Understand how various departments in a food service facility contribute to the economic success of a business. B5.6 Prioritize tasks and plan work schedules based on budget and personnel.
- Illustrate and apply the basics of food preparation and safety and sanitation in professional and institutional kitchens.
- Use, maintain, and store the tools, utensils, equipment, and appliances safely and appropriately for preparing a variety of food items.
- Apply the principle of mise en place, including the placement and order of use of ingredients, equipment, tools, and supplies.
- Prepare food by using the correct terminology, food safety, techniques, and procedures specified in recipes and formulas.
- Plan and follow a food production schedule, including timing and prioritizing of tasks and activities.
- Evaluate the qualities and properties of food items and ingredients used in food preparation.
- Design plating techniques, including accurate portioning and aesthetic presentation skills.

- Develop a food preparation plan using forecasting and cross-utilization of products to maximize profit and eliminate waste.
- Illustrate and apply the basics of baking, pastry, and dessert preparation and safety and sanitation in professional and institutional kitchens.
- Use, maintain, and store the tools, utensils, equipment, and appliances safely and appropriately for preparing, serving, and storing baked goods, pastries, and desserts.
- Apply the principle of mise en place, including the placement and order of use of the ingredients, equipment, tools, and supplies unique to baking and pastry production.
- Produce baked goods, pastries, and desserts by using the correct terminology, food safety, techniques, procedures, and various finishing techniques. B7.4 Evaluate the qualities and properties of food items and ingredients used for baked goods, pastries, and desserts.
- Understand packaging and merchandising techniques to feature seasonal and standard bakery products.
- Develop a plan using forecasting and cross-utilization of products to maximize profit and eliminate waste.
- Apply the knowledge and skills essential for effective customer service.
- Analyze the importance of customer service to the success of the food service establishment.
- Demonstrate the concept of exceptional customer service and know ways of anticipating the needs and desires of customers to exceed their expectations.
- Recognize common customer complaints and the service solutions for preventing or resolving complaints.
- Understand the roles of management and employees in effectively meeting the needs of culturally, generationally diverse, special needs customers.
- Interact with customers in a positive, responsive, and professional manner.
- Apply the basic procedures and skills needed for food and beverage service.
- Differentiate the required duties of various positions, including those of the host/hostess, wait staff, bus person, and others related to opening, closing, change-of-shift, and preparatory work.
- Apply the concept of mise en place in relation to food and beverage service.
- Practice safe, efficient, and proper procedures for setting, serving, maintaining, and busing tables.
- Practice proper techniques for customer service, including greeting, seating, presenting and explaining menu items, and taking customer orders.
- Integrate appropriate, effective, and efficient techniques for writing food and beverage orders, relaying orders to the kitchen, coordinating and assembling food orders, and preparing and presenting checks to customers.
- Apply procedures for handling cash transactions, converting currency, and identifying counterfeit currency.
- Apply the procedures for handling noncash transactions including: credit cards, debit cards, ATM cards, money orders, personal checks, coupons, discounts, and online transactions.
- Conduct all financial transactions in an accurate, professional, and ethical manner, including gratuities.

- Produce a product that identifies and explains the impact of theft on the food service and hospitality industry.
- Demonstrate and apply basic nutritional concepts in meal planning and food preparation.
- Apply basic nutritional principles and know how to use food preparation techniques that conserve nutrients.
- Interpret nutritional or ingredient information from food labels and fact sheets and analyze menu items to meet the dietary needs of individuals.
- Create nutritious, creative, and profitable menus in accord with availability and demand.
- Demonstrate an understanding of the basic processes of costing and cost analysis in food and beverage production and service.
- Understand the customer's perception of value and its relationship to profit and loss.
- Understand the components of a profit and loss statement emphasizing food and labor costs.
- Utilize the practices of reduce, reuse, and recycle to maximize profits.
- Understand the importance and structure of standardized systems, such as the Uniform System of Accounts for Restaurants.
- Evaluate the importance of the menu as the primary source of revenue generation and cost control.
- Calculate recipe costs and pricing per portion and compare the cost per cover to the theoretical cost.
- Describe the fundamentals of successful sales and marketing methods.
- Recognize methods to develop and maintain long-term customer relations.
- Identify the major market segments of the industry and understand how marketing principles and procedures can be applied to target audiences.
- Understand basic marketing principles for maximizing revenue based on supply and demand and competition.
- Understand the value of advertising, public relations, social networking, and community involvement.
- Research the various types of entrepreneurial opportunities in the food service industry.
- Design marketing strategies, including branding, benchmarking, and promotional selling and upgrading and their effect on profits.

Information & Communication Technology

NETWORKING PATHWAY

Students in the Networking pathway prepare for careers that involve network analysis, planning, and implementation, including the design, installation, maintenance, and management of network systems. The successful establishment, maintenance, and securing of information and communication technologies infrastructure is critical to the success of every twenty-first-century organization. Employment continues to grow for persons with expertise in networking.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content

Pathway Completer students have mastered the content

Networking Pathway Students Will:

- Identify and describe the principles of networking and the technologies, models, and protocols used in a network.
- Define the terminology used in the design, assembly, configuration, and implementation of networks.
- List the fundamental elements of the major networking models established by the industry standards of recognized organizations: the Open System Interconnect (OSI) or transmission-control/Internet protocol (TCP/IP) models.
- Identify and explain how data, voice, and video/communications are carried through the most common network media.
- List the characteristics, advantages, and disadvantages of the various networking presentation functions, data formatting, data encryption, and data compression.
- Explain the characteristics of networking hardware and applications and the methods to deploy them.
- Design and document data/communication systems networks.
- Identify, describe, and implement network media and physical topologies.
- Use appropriate wiring and wireless standards and plan, install, and maintain media (copper, fiber, and wireless) for a variety of network systems.
- Demonstrate standard procedures and practices for safely using tools and working safely around the electrical environment in various networking systems.
- Test and maintain wired and wireless network communications components and systems.
- Install, configure, and differentiate between common network devices.
- Identify and describe the functions of various network devices, including network connectivity hardware.
- Describe the differences between various network environments: peer-to-peer, client-server, thin client, virtualized, internetworks, intranets, and extranets.
- Distinguish between the topologies and protocols of local area networks and those of wide area networks.
- Confirm operating parameters, apply test procedures, make necessary adjustments, and assemble the components of a network system or subsystem.
- Configure the major addressing and routing protocols used in networking.
- Implement a functional wired and wireless network, including the installation and configuration of components, software, and plug-ins.
- Evaluate, select, and deploy a variety of network architectures, information and communication technologies, and protocols.
- Demonstrate proper network administration and management skills.
- Identify and use network tools to troubleshoot and verify network availability and performance.
- Identify common customer policies and procedures, including those for management of incidents.
- Identify the implications of major protocols and international standards and their impact on network management.

- Apply appropriate technologies to improve network performance for data, voice, and video transmission.
- Apply the proper security patches, updates, and procedures necessary to maintain and support a network.
- Use common help-desk tools and resources, such as incident tracking, knowledge database, and staffing to administer and manage a network.
- Apply known effective methods of disseminating information and instruction to users.
- Use project management skills and tools for managing and maintaining various types of networks.
- Analyze network system interdependencies and constraints.
- Demonstrate how to communicate and interpret information clearly in industry-standard visual and written formats.
- Classify and use various electronic components, symbols, abbreviations, and media common to network topology diagrams.
- Interpret, organize, and communicate complex network diagrams by using information collected from detailed drawings.
- Use and assess network communication applications and infrastructure.
- Identify and document the appropriate uses of networking services, products, and applications.
- Evaluate the features of communications software products in terms of their appropriateness to organizational tasks.
- Configure compatible systems across various platforms and types of media.
- Analyze a customer's organizational needs and requirements to identify networking needs.
- Describe the effective management of human, financial, and communications resources from the standpoints of the user and the provider.
- Diagram physical and logical layouts of networks that support information and communication technologies.
- Evaluate emerging products, services, and business models in relation to the creation, setup, and management of networks that support information and communication technologies.
- Evaluate, create, and process voice, video, and data transmissions.
- Identify security threats to a network and describe general methods to mitigate those threats.
- Identify and define command network security threats: hackers, crackers, viruses, worms, and Trojan horses.
- Describe the importance of classifying appropriate monitoring devices and procedures for quick identification and prevention of security violations.
- List the policies and procedures for routine administration, such as user agreement, incident reporting, and recovery for users.
- Identify common potential risks and entrance points, including internal and external risks, and the tools used to neutralize them: firewalls; monitoring; and antivirus, spyware, and spam protection.
- Identify and apply common techniques for disaster prevention and recovery.

GAMES & SIMULATIONS PATHWAY

Students in the Game and Simulation pathway learn relevant technical knowledge and skills to prepare for further education and careers such as Game/Simulation Designer, Game Programmer, and Game Software Developer. Game and simulation design requires that students have a solid foundational understanding of game design, hardware, graphics, and animation. Persons with expertise in game and simulation design have had practical experiences in game/simulation conceptualization, design, storyboarding, development methodologies, essential programming techniques, working with a team, and implementation issues.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Games & Simulation Pathway Students Will:

- Identify and describe critical game and simulation studies, the resulting societal impact, and the management, industry, and career requirements.
- Categorize the different gaming genres and gaming systems.
- Describe the historical significance of electronic and nonelectronic games.
- Describe the role of play in human culture.
- Describe the psychological impact of games on individuals and groups.
- Describe the business model commonly used in the game development industry.
- Examine and categorize the significant processes in the production of interactive games.
- Identify the core tasks and challenges that face a game or simulation design team.
- Describe legal issues that affect games, developers and players.
- Describe the impact of the game and simulation industry on the economy.
- Demonstrate an understanding of game and simulation analysis, design, standard documentation, and development tools.
- Demonstrate an understanding of the vocabulary for discussing games and play by listing and describing the general procedure and requirements of game and simulation design.
- Describe the game development life cycle.
- Develop a game design document or blueprint.
- Understand the general principles of storytelling and the use of storyboarding in game design.
- Know how to use tools and software commonly used in game/simulation development and become familiar with popular game tools and different gaming engines.
- Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design.
- Describe the complex interaction between games and players and the role it plays in the popularity of a game.
- Experience the methods used to create and sustain player immersion.
- Demonstrate an understanding of interface design, hardware constraints on games, including processors and I/O devices, and nonhardware constraints.

- Make informed decisions about game physics: how the game world works, how the players interact with the game world, and how the players interact with one another.
- Create a working game or simulation individually or as part of a team.
- Create a storyboard describing the essential elements, plot, flow, and functions of the game/simulation.
- Create a design specification document to include interface and delivery choices, rules of play, navigation functionality, scoring, media choices, start and end of play, special features, and development team credits.
- Using simple game development tools, create a game or simulation.
- Present the game or simulation.
- Identify, describe, and implement standard game/simulation strategy and rules of play.
- Understand strategic outlining in game designs.
- Know elements of puzzle design.
- Use key strategic considerations in game design
- Understand the process of creating and designing player actions.
- Create and design the game flow as it relates to story and plot.
- Assess common principles and procedures in game flow design.
- Describe rule creation elements of player challenge.
- Integrate music, sound, art, and animation as it applies to the environmental design of the game/simulation.
- Understand the methodologies for integrating digital media into a game or simulation.
- Identify commonly used art and animation production tools in the game design industry.
- Understand the general concepts of environmental design.
- Describe how environmental design is used in conjunction with game level design.
- Explain the role and principles of event modeling and interface design and apply those principles in a game/simulation design and project.
- Define the meaning of simulation and pertinent issues facing game designers
- Describe applied event modeling as it relates to game design.
- Identify and describe the basic Human Computer Interface (HCI) design principles
- Apply the “eight golden rules” of interface design.
- Understand the use of inventory systems in game design.
- Acquire and apply appropriate programming skills for rendering a single player or multiuser game or simulation project, including program control, conditional branching, memory management, scorekeeping, timed event strategies, and implementation issues.
- Identify functions of information processing and describe basic network terminology and network security and demonstrate an understanding of operating systems, environments, and platforms.
- Plan program design and evaluate assigned game programming tasks.
- Code and test programs.
- Create and maintain documentation and perform program maintenance.
- Implement enhanced program structures.
- Implement multimedia programming.
- Acquire and apply appropriate artificial intelligence (AI) techniques used by the game development industry.
- Describe AI and how it relates to game and simulation design and development.
- Design, program, and implement intelligent agents for action games

- Use AI techniques, like finite state machines, to produce the illusion of intelligence in the behavior of nonplayer characters (NPCs).
- Create intelligently designed games that would educate as well as engage the players.

SOFTWARE & SYSTEMS DEVELOPMENT PATHWAY

Students in the Software and Systems Development pathway prepare for careers related to computer science that involve the design, development, implementation, maintenance, and management of systems that rely on software programs to satisfy the operational needs of modern business organizations. Persons with expertise in systems development and programming are critical to support operations like electronic commerce, medical records management, retail sales and inventory management, digital entertainment, and use of energy.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Software & Systems Development Pathway Students Will:

- Identify and apply the systems development process.
- Identify the phases of the systems development life cycle, including analysis, design, programming, testing, implementation, maintenance, and improvement.
- Identify and describe models of systems development, systems development life cycle (SDLC), and agile computing.
- Identify and describe how specifications and requirements are developed for new and existing software applications.
- Work as a member of, and within the scope and boundaries of, a development project team.
- Track development project milestones using the concept of versions.
- Diagram processes using flowcharts and the Unified Modeling Language.
- Define and analyze systems and software requirements.
- Describe the major purposes and benefits of development, including automation, improving productivity, modeling and analysis, and entertainment.
- Recognize and prevent unintended consequences of development work: programming errors, security issues, health and environmental risks, and privacy concerns.
- Develop strategies that target the specific needs and desires of the customer.
- Analyze customers' needs for development.
- Determine and document the requirements and alternative solutions to fulfill the customers' needs.
- Create effective interfaces between humans and technology.
- Describe and apply the basic process of input, processing, and output.
- Design effective and intuitive interfaces using knowledge of cognitive, physical, and social interactions.
- Support methods of accessibility for all potential users, including users with disabilities and non-English-speaking users.

- Develop software using programming languages.
- Identify and describe the abstraction level of programming languages from low-level, hardware-based languages to high-level, interpreted, Web-based languages.
- Describe the interaction and integration of programming languages and protocols such as how client-side programming can work with server-side programming to use a query language to access a database.
- Identify and use different authoring tools and integrated development environments (IDEs).
- Identify and apply data types and encoding.
- Demonstrate awareness of various programming paradigms, including procedural, object oriented, event-driven, and multithreaded programing.
- Use proper programming language syntax.
- Use various data structures, arrays, objects, files, and databases.
- Use object oriented programming concepts, properties, methods, and inheritance.
- Create programs using control structures, procedures, functions, parameters, variables, error recovery, and recursion.
- Create and know the comparative advantages of various queue, sorting, and searching algorithms.
- Document development work for various audiences, such as comments for other programmers, and manuals for users.
- Test, debug, and improve software development work.
- Identify the characteristics of reliable, effective, and efficient products.
- Describe the ways in which specification changes and technological advances can require the modification of programs.
- Use strategies to optimize code for improved performance.
- Test software and projects.
- Evaluate results against initial requirements.
- Debug software as part of the quality assurance process.
- Integrate a variety of media into development projects.
- Identify the basic design elements necessary to produce effective print, video, audio, and interactive media.
- Describe the various encoding methods of media and trade-offs: vector graphics vs. bitmaps, and bit depth.
- Use media design and editing software: keyframe animation, drawing software, image editors, and three-dimensional design.
- Develop a presentation or other multimedia project: video, game, or interactive Web sites, from storyboard to production.
- Analyze the use of media to determine the appropriate file format and level of compression.
- Integrate media into a full project using appropriate tools.
- Create and/or capture professional-quality media, images, documents, audio, and video clips.
- Develop Web and online projects.
- Identify the hardware (server) and software required for Web hosting and other services.
- Describe the full process of online content delivery, registering domain names, setting up hosting, and setting up e-mail addresses.

- Attract Web-site visitors through search engine optimization using various strategies like keywords and meta-tags.
- Enable e-commerce capabilities to sell products, create a shopping cart, and handle credit card transactions.
- Create an online project, Web-based business, and e-portfolio.
- Optimize fast delivery and retrieval of online content such as Web pages.
- Develop databases.
- Describe the critical function of databases in modern organizations.
- Identify and use the basic structures of databases, fields, records, tables, and views.
- Identify and explain the types of relationships between tables (one-to-one, one-to-many, many-to-many) and use methods to establish these relationships, including primary keys, foreign keys, and indexes.
- Use data modeling techniques to create databases based upon business needs.
- Use queries to extract and manipulate data (select queries, action queries).
- Develop databases that are properly normalized using appropriate schemas.
- Export and import data to and from other applications and a database recognizing the limitations and challenges inherent in the process.
- Analyze and display data to assist with decision making using methods like cross tabulations, graphs, and charts.
- Develop software for a variety of devices, including robotics.
- Demonstrate awareness of the applications of device development work, including personalized computing, robotics, and smart appliances.
- Install equipment, assemble hardware, and perform tests using appropriate tools and technology.
- Use hardware to gain input, process information, and take action.
- Apply the concepts of embedded programming, including digital logic, machine-level representation of data, and memory-system organization.
- Program a micro-controller for a device or robot.
- Develop intelligent computing.
- Describe models of intelligent behavior and what distinguishes humans from machines.
- Describe the major areas of intelligent computing, including perception, proximity, processing, and control.
- Know artificial intelligence methods such as neural networks, Bayesian inferences, fuzzy logic, and finite state machines.
- Implement artificial intelligent behavior through various methods: mathematical modeling, reinforcement learning, and probabilistic analysis.

Manufacturing & Product Development

MULTIPLE PATHWAYS

The Manufacturing and Product Development sector provides a foundation for secondary students in California in manufacturing processes and systems, including graphic design production, machine tooling and forming, welding and

materials joining, and product innovation and design. Students engage in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, and skill preparation in four pathways. The pathways emphasize real-world, occupationally relevant experiences of significant scope and depth in manufacturing. The knowledge and skills are acquired within a sequential, standards-based pathway program that integrates hands-on, project-based, and work-based instruction. Standards in this sector are designed to prepare students for entry to a career, postsecondary education, or advanced technical training.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Public Services

PUBLIC SAFETY PATHWAY

The Public Safety pathway prepares students with a broad-based foundational knowledge in careers that involve public safety. The educational foundation will assist students who wish to pursue related professional training at the postsecondary level. Students will gain experience through classroom instruction, hands-on training, and community exercises. The evolving integration of state public safety organizations, their connections with federal and state intelligence and security agencies, interoperability and coordination of effort, and the shared mission to protect the public in a post-9/11 world are areas of emphasis for the pathway. The careers included in this pathway primarily address law enforcement services, homeland and cyber security services, and correctional services.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Public Safety Pathway Students Will:

- Demonstrate an awareness of the personal, physical, and psychological qualities found in successful public safety job candidates, and recall critical types of decisions and outcomes which determine employability in public safety occupations.
- State the major types of occupations found in the Public Safety Pathway and the number of those occupations that require background-investigation security clearance and personal records free of disqualifying information
- Identify a range of personal choices and conduct that would disqualify an individual from public safety occupations, and describe ways to avoid such behaviors.

- Recognize the extent and scope of a background investigation, what sorts of information is collected, and how it may impact the evaluation of a candidate for a position in a public safety occupation.
- Know personal and ethical behaviors that demonstrate commitment to professional ethics and legal responsibilities.
- Demonstrate strategies and requirements for individuals and organizations to employ to respond to unethical and illegal actions in a variety of workplace situations.
- Understand the necessity of maintaining strong academic records, high levels of physical fitness, and positive personal history to successfully pursue a career in a public safety.
- Understand the selection process for many public safety occupations that require certifications, reading and writing assessments, psychological evaluations, medical evaluations, and probationary periods.
- Understand the importance of security and background checks, credit checks, and other assessments—including oral interviews and polygraph tests—that are required for some public safety occupations.
- Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace settings.
- Understand how loyalty, duty, honor, integrity, selfless service, and personal courage play an important role in many public safety occupations.
- Understand how to interact with others in ways that demonstrate respect for persons, property, individual lifestyle choices, and cultural differences.
- Compile a personal portfolio specific to the expectations for employment in a public safety career.
- Describe the history, shared mission, and roles of public safety agencies and professionals at the national, state, and local government levels.
- Recognize issues particular to policing and other public safety occupations, including accountability, codes of ethical conduct, jurisdiction, and civil rights of individuals.
- Describe the public safety agency role in saving lives, protecting lives and property, reducing the vulnerability of critical infrastructure, identifying key resources, and maintaining order.
- Describe public safety agency roles in preventing terrorism, enhancing security, managing border security, securing cyberspace, and preparing for and responding to emergencies and disasters.
- Identify the major public safety agencies at the international, national, state, and local levels, as well as scenarios (including response to catastrophic events with multiple casualties) that call for a referral to a higher-level agency or collaboration with other public safety agencies.
- Analyze information to make prompt, effective, and appropriate decisions.
- Use conflict-resolution and anger-management skills and procedures to resolve problems.
- Apply critical-thinking skills to manage emergency response situations.
- Survey the history of public safety agencies in the United States and their influence on the current systems.
- Analyze and evaluate ideas, proposals, and solutions to problems

- Create a scenario that includes a potential threat from terrorism, a hostage situation, or danger at a school site, describing who should respond and actions that should be taken.
- Demonstrate an understanding of the appropriate level of nutrition, fitness, and agility required by the public safety career fields.
- Understand the need for physical fitness and proper nutrition in the public safety career areas.
- Recognize the different physical agility assessments required for entrance into a public safety career and understand the skills and techniques necessary for success in agility testing.
- Design and implement a personal plan for achieving and maintaining an acceptable level of agility and a lifetime fitness mindset.
- Employ active listening, concise reporting, and familiarity with professional equipment to communicate effectively.
- Know the basic techniques and methods of active listening to obtain and clarify information in oral communications.
- Demonstrate effective methods of communicating with the public with a variety of techniques, such as command presence, active listening, and empathy; projecting a professional tone of voice; paraphrasing; and the proper use of nonverbal body language.
- Demonstrate the use of clear, concise, and legible entries based on experience and observation to prepare and submit required reports.
- Understand the professional use of a variety of communication methods and equipment.
- Practice public safety verbal communication techniques that can be used when interacting with difficult individuals.
- Narrate a sequence of events consistent with agency reporting formats
- Convey information and ideas from primary and secondary sources accurately and coherently, consistent with agency report-writing formats
- Understand the laws, ordinances, regulations, and organizational policies that guide public safety career fields.
- Describe how federal, state, and local laws and regulations affect public safety operations.
- Explain the importance of individual liberties and civil rights provided in the Constitution and how public safety workers should safeguard these rights when interacting with the public.
- Prepare a chart showing the organizational chain of command and other administrative systems to assign tasks and responsibilities for maximum effectiveness.
- Know the skills and equipment needed to deal with various types of situations found in public safety occupations (e.g., working with special populations, responding to emergencies, and assisting with incident
- Know the principles of emergency communications management and the importance of technological interoperability for information sharing among public safety agencies and for effective public address/warning systems.
- Identify the skills required to deal effectively with emergency situations.
- Become familiar with personal safety procedures to meet prescribed regulations and situations.

- List the key elements of an action plan.
- Understand the safety and health issues related to serving persons with disabilities.
- Demonstrate the techniques for restraining individuals without violating their individual rights or jeopardizing safety.
- Practice basic emergency lifesaving techniques in order to apply those skills as needed in emergencies.
- Implement procedures for emergency response and know the requirements for handling hazardous materials—in normal and emergency situations—to avoid health and environmental risks (e.g., airborne and blood-borne pathogens, contamination).
- Explain the management of crisis negotiations to promote the safety of individuals and the public.
- Apply appropriate problem-solving strategies and critical-thinking skills to work-related issues and tasks.
- Demonstrate an understanding of the major elements and career opportunities within the United States Department of Defense (DOD), including the Army, Navy, Marine Corps, Air Force, and Coast Guard.
- Describe the mission and role of the DOD and the individual armed services.
- Understand the chain of command within organizations of the DOD.
- Understand the initial entry assessments of physical, educational, and legal for military recruitment and levels of service
- Describe the structure and composition of the DOD.
- Understand and adhere to the following personal attributes within the DOD: leadership, teamwork, fitness, honor, integrity, respect, selfless service, and personal courage.
- Describe the need for, and the responsibilities of, the following functions within the DOD: armored security, maritime security and welfare, air superiority, space operations, and cyber security.
- Understand the role and structure of federal agencies and national organizations.
- Demonstrate an understanding of the functions and career opportunities within the U.S. Department of Homeland Security (DHS).
- Describe the mission, roles, and responsibilities of the U.S. Department of Homeland Security.
- Assess the local, state, national, and global perspectives on homeland security and the implications of protecting the public from natural and man-made threats to public safety.
- Recognize the impact of the September 11, 2001, terror attacks on the security and intelligence community structure and the resulting emphasis placed on coordination and cooperation between public safety agencies.
- Identify the current global and national issues and policies concerning terrorism and homeland security.
- List the various techniques and methods of infrastructure and facilities protection.
- Understand the role of cyber-security professionals within the homeland defense community and the methods and techniques used to combat public and private cyber attacks.
- Survey the roles, functions, and interdependency among local, federal, and international law enforcement, intelligence, and military agencies.
- Analyze the various elements of emergency preparedness, including emergency response and recovery, within the context of homeland security.

- Demonstrate an understanding of the functions of the U.S. Foreign Service.
- Describe the primary mission of the U.S. Department of State and the role of the Foreign Service within that Department.
- Describe the primary mission and role of the Foreign Service.
- Describe the roles and responsibilities of different career tracks within the Foreign Service: Consular Officers, Economic Officers, Management Officers, Political Officers, and Public Diplomacy Officers.
- Research the history of the Foreign Service and describe how its careers have evolved and how the Foreign Service has impacted the United States and other societies.
- Describe the countries and settings in which Foreign Service Officers serve.
- Understand the potential impact of assignments to “hardship posts” and dangerous posts on life and family choices.

EMERGENCY RESPONSE PATHWAY

The Emergency Response pathway encompasses standards for designing student coursework in preparation for a number of careers in this field. The standards provide the foundation for further professional education and training at a postsecondary level, leading to certification and employment. By mastering these standards, students gain critical knowledge and skills through classroom and job-site experiences, simulations, and other learning modalities. Careers in this pathway include those in fire services, emergency medical services, wildland services, and emergency management.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Emergency Response Pathway Students Will:

- Analyze the characteristics of different career fields within the Emergency Response pathway to develop a perspective on the nature of the work, entry-level requirements, career options, and expectations.
- Understand the responsibilities, requirements, and advancement opportunities in emergency response careers.
- List the standards for emergency response employee qualifications, training, and certification.
- Outline a realistic program of study (education plan) based on career choice, job-entry requirements, and personal commitment.
- Describe the roles and responsibilities of emergency response agencies.
- Summarize the laws, regulations, and organizational protocols that define the guidelines governing selected emergency agencies and services.
- Understand the processes by which emergency management organizations and emergency managers exert command and control over an emergency response and recovery operation.
- Describe the mechanisms by which emergency management stakeholder agencies and resources are coordinated for mutual aid.

- Understand the importance of an organized Command and Control System to provide for interoperability, efficiency, and effectiveness.
- Understand the core set of basic concepts, principles, terminology, and technologies of emergency response management.
- Recognize multiagency coordination; unified command, training, identification and management of resources; qualification and certification; and the collection, tracking, evaluation, and dissemination of information.
- Describe the principles and responsibilities of the Incident Command System (ICS) and the National Incident Management System (NIMS)
- Review a simulated local hazard mitigation plan based on a potential hazard to the community, and describe the appropriate response.
- Design an emergency plan for an earthquake in a major metropolitan area that has shut off access from all directions.
- Demonstrate necessary leadership qualities, team concepts, and personal integrity for emergency response personnel.
- Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in emergency services.
- Understand the characteristics and benefits of teamwork, leadership, and citizenship in community and workplace settings.
- Employ active listening, concise reporting, and familiarity with emergency response communication equipment to interact efficiently and effectively.
- Describe emergency response techniques and methods of active listening to obtain and clarify information in oral communications.
- Demonstrate a variety of appropriate and effective methods of communicating with the public, including techniques such as professional demeanor, active listening, empathy, projecting a confident tone of voice, paraphrasing, and the proper use of nonverbal body language.
- Adhere to Health Insurance Portability and Accountability Act (HIPAA) regulations and agency guidelines regarding public and media communications.
- Use appropriate terminology in clear, concise, and legible report entries when preparing and submitting required reports.
- Use and maintain a variety of communication equipment, understanding the importance of using current and up-to-date technology and communication equipment.
- Practice verbal and nonverbal emergency terminology and communication techniques to be used when interacting with emergency response personnel in a variety of emergency situations.
- Gather information and ideas from primary and secondary sources accurately and coherently.
- Execute safety procedures and protocols associated with local, state, and federal regulations in order to effectively and safely conduct duties within fire and emergency services.
- Describe the basic elements of safety and survival for emergency response personnel.
- Know and use the appropriate personal protective equipment (PPE) required for emergency services duties.
- Know how to establish situational awareness, identify hazards, and assess personal, team, or environmental risks.

- Understand and adhere to comprehensive and systematic risk management strategies to reduce injury and fatalities for self, team, and community.
- Demonstrate strategies to identify and eliminate hazards.
- Complete certification in emergency care as appropriate—for example, cardiopulmonary resuscitation (CPR), automated external defibrillator (AED), and first aid.
- Develop the level of nutrition, fitness, strength, agility, and psychological health and wellbeing required for safely working in emergency response career fields.
- Understand that physical fitness and proper nutrition are needed to perform the duties of emergency response personnel.
- Recognize the different physical strength and agility assessments required for entrance into emergency response employment.
- Apply the skills and techniques necessary for success in strength and agility testing.
- Design and implement a personal plan for achieving and maintaining an acceptable level of nutrition, strength and agility, and a lifetime fitness mindset.
- Recognize and understand the importance of maintaining psychological health and well-being in emergency response occupations.
- Understand the roles of federal, state, and local agencies in catastrophic event planning, preparation, response, and recovery.
- Describe steps for each potential catastrophic event.
- Analyze the history and outcomes of catastrophic events and the appropriate emergency responses.
- Review a hazard mitigation plan to reduce death and injury for potential man-made and natural hazards.
- Prepare an emergency preparedness and response plan that includes the roles of emergency response personnel for a potential catastrophic event in the community.
- Recognize the importance and variety of recovery strategies to support individuals and communities impacted by a catastrophic event.
- Research and define what is considered to be hazardous materials incidents and threats.
- Describe commonly encountered hazardous materials.
- Describe the hazardous materials labeling system and identify definitions associated with various hazardous materials.
- Describe the type of damage and injury that can occur if hazardous materials are handled improperly.
- Explain the steps taken, including appropriate personnel and safety measures, for a hazardous-material release.
- Research and report on the most common incidents involving hazardous materials.
- Understand the fundamental mission of fire services occupations and the responsibility to preserve life and property, promote public safety, and reduce fire deaths.
- Understand the history, organization, and operation of fire services.
- Describe the skills and knowledge necessary for an entry-level firefighter to safely perform the tasks required of the job.
- Explain the fundamentals and scientific principles of fire behavior, combustible materials, extinguishing agents, hazardous and toxic materials, forms of energy, and fire prevention/suppression techniques for all types of fires and conditions.
- Demonstrate the operation of fire protection equipment and systems

- Demonstrate the skills necessary to perform fire suppression and basic rescue operations using firefighting techniques and rescue equipment.
- Identify structural characteristics of building construction types as they relate to fire protection and suppression, and recognize the signs and causes of potential building collapse and other hazards.
- Apply principles of proper body mechanics, including ergonomics, equipment use, and techniques to prevent personal injury.
- Participate in public education aimed at reducing loss of life and property, through programs and activities on fire prevention and safety as well as other injury-prevention education.
- Demonstrate the immediate basic life support and interim medical care for a sick, injured, or compromised person until advanced medical care is provided or transport is initiated.
- Understand and use medical terminology and related knowledge of anatomy, physiology, diseases, diagnoses, pharmacology, therapeutics, and common abbreviations necessary for emergency medical services.
- Know the common acronyms used in fire and emergency services.
- Perform technical skill and equipment use required for emergency response occupations—for example, airway, oxygen, and ventilation procedures; suction; bleeding control; shock management; cardiac arrest management; immobilization techniques; traction; splinting; transport; defibrillation; and wound management.
- Follow instructions for immediate care procedure as transmitted by an emergency medical dispatcher during transport.
- Demonstrate administration of a limited number of drugs appropriate to the scope of practice.
- Manage an incident scene as the first responder, using emergency response skills appropriate to training and certification.
- Execute protocols in emergency management response when working with an on-scene accident
- Demonstrate the ability to assess the nature and extent of an illness or injury to establish and prioritize medical response.
- Communicate with treatment-center staff to arrange reception of victims and to get instructions for further treatment.
- Demonstrate the ability to receive and provide patient-care information to other medical providers.
- Describe the function of emergency vehicles, use of medical and communication equipment, and the necessity of maintaining inventory as required for emergency services practices and procedures.
- Analyze and describe the functions and responsibilities of federal, state, and local wildland services.
- Describe wildland firefighter safety and survival preparations
- Explain the role of fire personnel in wildland fires, structure fires, auto accidents, medical aid, swift-water rescue, civil disturbances, search and rescue operations, hazardous material spills, train wrecks, floods, and earthquakes.
- Describe fire prevention and planning procedures to save wildland structures during a forest fire.

- Assess the value of the resource management program, including the impact on timber, watershed, wildlife, and recreation.
- Create a state map showing the locations of wildland lookouts, and describe the lookouts' purpose and staffing.
- Evaluate the importance of the fire suppression aviation program.
- Recognize factors that influence the start and spread of wildland fires.
- Describe and evaluate the importance of the various types of equipment used to control and/or extinguish wildland fires.
- Build a plan describing processes and procedures to follow prior to, during, and after a wildfire event

Transportation

SYSTEMS DIAGNOSTICS, SERVICE & REPAIR PATHWAY

The Systems Diagnostics, Service, and Repair pathway prepares students for postsecondary education and employment in the transportation industry, which includes but is not limited to motor vehicles, rail systems, marine applications, and small-engine and specialty equipment.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Systems Diagnostics, Service, & Repair Pathway Students Will:

- Demonstrate the practice of personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.
- Know and understand common environmental conservation practices and their applications.
- Practice the safe handling and storage of chemicals and hazardous wastes in accordance with Material Safety Data Sheets (MSDS) and the requirements of local, state, and federal regulatory agencies.
- Understand the way in which waste gasses, emissions, and other environmentally destructive substances are generated and the effects of these substances on the environment.
- Use appropriate personal protective equipment and safety practices.
- Evaluate the advantages and disadvantages of existing, new, and emerging systems and the effects of those systems on the environment.
- Practice the safe and appropriate use of tools, equipment, and work processes.
- Recognize the importance of calibration processes, systems, and techniques using various measurement and testing devices.
- Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components.
- Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).
- Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.
- Use measurement scales, devices, and systems, such as dial indicators and micrometers, to design, fabricate, diagnose, maintain, and repair vehicles and components following recommended industry standards.
- Demonstrate how to access technical reports, manuals, electronic retrieval systems, and related technical data resources.

- Test and analyze the elements of precision measuring using standard and metric systems.
- Use scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems.
- Describe the operating principles of internal and/or external combustion engines.
- Describe the function and principles of air-conditioning and heating systems.
- Describe the basic principles of pneumatic and hydraulic power and their applications.
- Describe the applications of alternative power sources.
- Practice the basic principles of electricity, electronics and electrical power generation, and distribution systems.
- Explain the principles of converting energy from one form to another.
- Perform necessary procedures to maintain, diagnose, service, and repair vehicle systems and malfunctions.
- Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.
- Communicate the procedures and practices of various manufacturers regarding service, repair, and maintenance schedules.
- Demonstrate how to properly document maintenance and repair procedures in accordance with applicable rules, laws, and regulations (e.g., Bureau of Auto Repair [BAR], Occupational Safety and Health Administration [OSHA], and the California Air Resources Board [ARB]).
- Use reference books, technical service bulletins, and other documents and materials related to the service industry available in print and through electronic retrieval systems to accurately diagnose and repair systems, equipment, and vehicles.
- Complete a work order, including customer information, description of repairs, and billing information, in accordance with applicable rules, laws, and regulations.
- Apply and understand appropriate business practices.
- Identify work-related systems common to the transportation service industry.
- Know the laws and regulations applicable to recordkeeping and the appropriate handling and disposal of hazardous materials.
- Explain the importance of and the procedures for maintaining accurate records (e.g., business licenses, repair orders, billing and tax records).
- Practice the concept and application of accepted ethical business practices.
- Practice the concept and application of acceptable customer relations practices.
- Recognize, analyze, and evaluate the need for maintenance of components and systems and the conditions under which service and maintenance are required.
- Demonstrate the application, operation, maintenance, and diagnosis of engines, including but not limited to two- and four-stroke and supporting subsystems.
- Perform general engine maintenance, diagnosis, service, and repair in accordance with portable national industry standards, such as the National Automotive Technicians Education Foundation and the Equipment and Engine Training Council.
- Maintain, diagnose, service, and repair lubrication and cooling systems.
- Practice how to maintain, diagnose, and repair computerized engine control systems and other engine-related systems.
- Maintain, diagnose, service, and repair ignition, electronic, and computerized engine controls and fuel management systems.

- Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards.
- Practice maintenance, diagnosis, and repair of electrical systems.
- Maintain, diagnose, repair, and service batteries.
- Demonstrate maintenance, diagnosis, service, and repair of starting and charging systems.
- Diagnose, service, and repair lighting systems
- Diagnose, service, and repair heating and air-conditioning systems and components.
- Diagnose, service, and repair horns, wipers/washers, and other accessories.
- Perform necessary procedures to maintain, diagnose, service, and repair vehicle electrical and electronic systems and malfunctions.
- Demonstrate the function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with national industry standards.
- Describe how to maintain, diagnose, service, and repair hydraulic and power assist systems.
- Describe the function and operation of automatic and manual transmissions and transaxles.
- Diagnose, service, and repair disc brakes, drum brakes, antilock brakes, and other brake systems as developed.
- Diagnose, service, and repair steering and suspension systems.
- Interpret tire and rim sizing to select appropriate wheels and tires for vehicles.
- Maintain, diagnose, service, and repair under-vehicle systems and malfunctions.

OPERATIONS PATHWAY

The Operations pathway prepares students for postsecondary employment and education in a variety of career opportunities in the transportation industry, including but not limited to harbors, ports, warehousing, marine applications, airplanes, trains, vehicles, and specialty equipment.

Level 1 students have been introduced to the content
Level 2 students have a comprehensive understanding of the content
Pathway Completer students have mastered the content

Operations Pathway Students Will:

- Evaluate and assess all aspects of facilities and facility planning for efficient and effective processing/handling of people, goods, and services in the transportation industry (housing, storage, maintenance, parts).
- Recognize the importance of space and location of equipment.
- Define and understand highway, rail, harbor, port, and airport controls.
- Identify where to place equipment for effective and efficient processing.
- Explain the difference between office area and processing areas.
- Design a/an processing center/office/shop.

- Describe and identify tools, techniques, and systems used to plan, staff, lead, and organize human resources as it relates to the transportation sector.
- Define the role of management and the responsibility and importance that are required to hold or maintain a position.
- Describe the production and use of industry-generated documents, records, and forms as well as related management skills used in the transportation industries.
- Understand work-related systems of the transportation industries.
- Maintain accurate records as applicable.
- Understand how guidelines, rules, regulations, and laws control transportation-industry practices and how they are overseen by local, state, federal, and international agencies.
- Explore career paths and opportunities within the transportation industry.
- Analyze asset acquisition and procurement needs.
- Research the various types of communication systems needed.
- Demonstrate an understanding of the concepts and processes needed to move, store/house, locate, and/or transfer people, goods, and services.
- Identify and understand transportation options such as rail, air, road, and sea.
- Define the different types of process controls available.
- Describe hazardous and nonhazardous materials handling.
- Understand process controls, from planning to completion.
- Determine the uses of information systems in the order fulfillment process.
- Determine the effects of government regulations on stock handling techniques and warehousing.
- Explore the functions of the shipping and receiving process in the success of the distribution function.
- Evaluate types of inventory controls.
- Demonstrate an understanding of business fundamentals, uses and application of technologies, communications, and basic management functions.
- Describe current business and marketing trends.
- Identify and analyze the risks associated with obtaining business credit.
- Identify considerations in planning and implementing marketing/business strategies.
- Identify target audience for specific marketing and sales needs.
- Identify the legal aspects of sales contracts and warranties.
- Explain the nature of sales forecasting and marketing needs.
- Understand the practices of acceptable customer relations services.
- Compare and contrast advantages and disadvantages of business ownership
- Analyze and evaluate the design advantages and disadvantages of transportation-industry systems and the effects of those systems on people and the environment.
- Identify environmental conditions that would impact various aspects of the transportation industry.
- Identify steps necessary to design a specific mode of transportation using aerodynamics.
- Research the effects of ergonomics on the health and safety of workers and customers.
- Create a model of a vehicle (train, airplane, railroad, car) incorporating ergonomics and aerodynamics in the design.
- Demonstrate safety practices pertaining to the transportation industry, including requirements of the Occupational Safety and Health Administration (OSHA),

Environmental Protection Agency (EPA), Air Quality Management Districts (AQMDs), and other regulatory agencies.

- Extract information from Material Safety Data Sheets (MSDS) pertaining to chemicals used in the workplace.
- Locate regulatory information and manufacturer recalls.
- Conform to federal, state, and local regulations and manufacturers' specifications when handling, storing, and disposing of chemicals and equipment, including necessary certifications.
- Adhere to ergonomic and environmental safety regulations in the workplace.
- Participate in compliance training activities and exercises.
- Determine the safe and correct application and use for chemicals used in the transportation industry.
- Describe and identify the infrastructures required and used in the transportation industry.
- Identify the infrastructure needed to move people, goods, and equipment from one location to another (highways, bridges, waterways, railways).
- Recognize the need for traffic signals, signs, and markings.
- Define fueling infrastructure needed to move vehicles, equipment, goods, and services from one location to another.
- Explain the importance of infrastructure in transporting vehicles, goods, and/or equipment in our everyday lives.
- Evaluate the need to safely move fluids from one location to another.