Silicon Valley
Career Technical Education

Medical Science / Health Careers

Course Outline

Course Description

Medical Science/Health Careers course is a 519-hour hands-on course designed to provide students an overview of the different careers associated with health sciences and health technology. It prepares students for entry level employment and introduces the student to the various careers within the health field and the necessary training required. It covers general anatomy & physiology, public health, mental health, medical terminology, nutrition, vital signs, cellular physiology, medical math, bioethics, confidentiality, and job-seeking skills. In addition, this course offers physical, emotional, social and cultural instruction that will provide the student with the skills necessary to give effective patient care in long-term care facilities, hospitals, home health and other patient care facilities. Upon course completion and obtaining a grade C or better, students will receive an HHA certification and will be prepared for entry level positions as a Home Health Aide (HHA).

Course Details

Length of Program and Academic Credits Earned:
Year-long 3 hour course = 519 hours
30 total units per year (15/semester):

- 20 non-a–g elective credits (10/semester)
- 10/10 UC “d” lab science and “g” elective credits (5/5semester)

Pre-Requisites:

- High School Junior or Senior, or 16 years or older
- Completed health or biology course
- Algebra

CTE Classification:

- **Industry Sector:** Health Science & Medical Technology
- **Industry Pathway: A. Biotechnology Pathway**
  - B: Patient Care Pathway
  - E. Public and Community Health Pathway
  - F. Mental and Behavioral Health Pathway
- **CA Basic Education Data System (CBEDS) Code:** 4253

Work-Based Learning:

- Internships for 160 hours or more may be available for students meeting certain criteria. Hours can be completed in the following facilities: hospital, medical clinics,

Certifications & State Tests:

- SVCTE Certificate of Competency with successful completion of course with a grade of “C” or better
- Home Health Aid – (with successful completion of course requirements)

chiropractic clinics, dental clinics and convalescent facilities. • Guest Speakers • Field Trips	• CPR/First Aid/AED – (with successful completion of course requirements) • Bloodborne Pathogens – (with successful completion of course requirements)

Community College Articulations

Students completing two semesters with a grade of "B" or better are granted college credits at the following community colleges:

Evergreen Valley College 1.0 unit (evc.edu/academics/academic-affairs/nursing-allied-health)
Mission College 7.5 units (missioncollege.org/depts/health/)
West Valley College 7.0 units (westvalley.edu/academics/applied_arts_sciences/health_care_technology/)

Possible Education & Career Pathways

For more career information: www.onetonline.org

College & Career Pathways:	Career Opportunities	O*NET Codes
Post-Secondary: Students with a high school diploma and having successfully completed this course have a number of entry-level career opportunities, as well as continuing their education.	• Medical Secretaries • Medical Equipment Preparers • Psychiatric Aides • Orderlies • Pharmacy Aides • Home Health Aides	43-6013.00 31-9093.00 31-1013.00 31-1015.00 31-9095.00 31-1011.00
Continuing Education: Including Community College, Training Programs, Certifications, etc: • AA or AS in Nuclear Technologist, Biology, Nursing, Emergency Technician, Early Childhood, Public Health, Kinesiology, Psychology	• Emergency Medical Technicians and Paramedics • Medical Records and Health Information Technicians • Medical and Clinical Laboratory Technologists • Registered Nurses • Radiologic Technicians	29-2041.00 29-2071.00 29-2012.00 29-1141.00 29-2099.06
University Majors & Degrees: • BA or BS in Medical Science, Biology, Health Sciences, Physical Therapy, Dietician, Nutritionist, Occupational Therapy, Nursing	• Registered Nurses • Child, Family, and School Social Workers • Community Health Workers	29-1141.00 21-1021.00 21-1094.00

	• Healthcare Social Workers • Biomedical Engineers • Molecular and Cellular Biologists	21-1022.00 17-2-31.00 19-1029.02
Post-Baccalaureate Degrees: • Masters or Doctorate in Medical Science, Biology, Health Sciences, Physical Therapy, Dietician, Nutritionist, Occupational Therapy, Nursing, Veterinary	• Surgeons • Neurologists • Nurse Practitioners • Sports Medicine Physicians • Psychiatrists • Pediatricians, General • Veterinarians • Health Educators	29-2099.07 29-1069.04 29-1171.00 29-1069.11 29-1066.00 29-1065.00 29-1131.00 21-1091.00

Unit 1: Anatomy & Physiology: "The World of What and How" 40 hours

Using an active learning approach and Next Generation Science Standards (NGSS), students will be introduced to the correlation between structure and function in the anatomy and physiology of the human body. This unit provides students the critical thinking skills necessary for exploration of illnesses and body structures. Students will correlate the major structures of the human body to various diagnostic images and pathophysiology in order to gain an in-depth knowledge of biological concepts. In depth topics include:

- Fluid and Electrolyte Balance
- Human growth and Development
- Cellular function
- Skeletal system
- Muscular system
- Nervous system
- Endocrine system
- Immune system
- Cardiovascular system
- Respiratory system
- Reproductive system
- Digestive system
- Urinary System
- Metabolism
- Tissues
- Special senses
- Integumentary

Standards Alignments:

CCSS: LS 11-12.1, 11-12.2, 11-12.4, 11-12.5,11-12.6; **RSIT** 11-12.1, 11-12.4, 11-12.7; **RRLST** 11-12.5, 11-12.7, 11-12.9, **WS** 11-12.2, 11-12.4; **AD** 12.7
NGSS: LS 1.B, 1.D, **ETS** 2.A

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **LAB- Anatomy Models & Identification:** Ongoing throughout the year, students will participate in a variety of labs in which they will be provided a skeleton or clay model depicting an organ system. Using a pencil to mark information directly onto the models, the students will write skeletal names on the model and identify bones with numbers, or write directly into the clay in order to identify muscles. Students will demonstrate their knowledge of the subject matter to the class and instructor through various presentations and oral defense.	1.0, 2.0, 4.0, 5.0, 9.0, 11.0	B 2.0, B 2.1, B 2.2, B 2.3, B 2.4

Assessment: peer observation, peer instruction**,** formative pencil-paper assessment		
✓ **Research:** Students will investigate the relationships of anatomy and physiology to specific diseases, and understand both qualitative and quantitative data. Students will collect data and other information from literature review, government websites and scientific journals, and will cite their sources. Students will present their findings in a variety of tables and graphs that depict their data most clearly. Interpretation of results and written material will be presented in APA format. **Assessment:** rubric, teacher provide writing continuums for students to compare their writing sample to determine what level they are working at and what they need to do to move to the next level, self assessment	1.0, 2.0, 4.0, 5.0, 6.0, 10.0, 11.0	B 4.0, B 3.2, B 4.4, B 4.5

Unit 2: Public Health: "Form a Better and Safer Domain" 37 hours

This unit is designed to engage students in matters associated with the health of societies locally, nationally, and globally. By analytically investigating biological, environmental, cultural, behavioral, historical, economic, and political factors that affect health, students become knowledgeable citizens who can consider the public's health in whatever life roles they undertake. This unit builds upon a broad foundation in the biological and behavioral sciences imbued with social ecology and population–based perspectives. This course also considers the environment — in particular, those facets of urban/suburban/semi-rural environments created by humans. This comprises how homes, neighborhoods, cities and regions influence public health, such as obesity, chronic disease, mental health, infectious disease, and injuries.

Standards Alignments:

CCSS: LS 11-12.1, 11-12.2, 11-12.3, 11-12.4, 11-12.5, 11-12.6; **RSIT** 11-12.1, 11-12.4,11-12.10; **RRLST** 11-12.1, 11-12.2; **WS**, 11-12.2, 11-2.7, 11-12.8, 11-12.9; **WHSST** 11-12.1, 11-12.8, 11-12.9, 11-12.10

NGSS: PS 1.A, 3.A, 3.C, 3.D; **LS** 2.C, 2.D, 3.A, 3.B, 4.A, 4.B

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Independent Community Experience:** Students will explore a variety of local public/community health facilities within their own community and arrange a visit to one that matches their interests. Students will take all steps necessary to secure a tour of the facility and arrange for someone at the site to provide them with an insightful and informative tour. After touring the facility, students will prepare a presentation for the class using a presentation software such as PowerPoint to include information about their facility, the public service provided by this facility, facility impact on the community and student impressions. In addition, students will submit a written summary/report of their visit. **Assessment:** demonstration stations, student presentations, written reports	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0	E 1.0, E 1.3, E 1.4, E 2.0, E 2.2, E 2.5, E 2.6, E 2.7, E 2.10
✓ **Build A Healthier World:** Students will work at the community level to address healthy living and prevent chronic disease. Students will investigate ways to prevent the spread of disease, choose one to focus on and l present and provide culturally appropriate and accessible health education posters,	1.0, 2.0, 4.0, 5.0, 6.0, 9.0, 10.0, 1.01	E 2.0, E 2.1, E 2.3, E 2.6, E 2.7, E 2.10, E 2.11, E 2.12

pamphlets, and healthcare institutional flyers to various SVCTE classes on community health topics to include: infection control, proper hand washing, communicable disease prevention, public health education announcements **Assessment:** teacher observation of drawings, posters, pamphlets, flyers, etc., examples and non-examples		E 3.0, E 3.1, E 3.2, E 3.3, E 3.4, E 3.5
✓ **Tackle Current And Future Public Health Challenges:** Students will investigate, design, evaluate, and refine an intervention strategy for a problematic public health issue. Students will review information about which policies, practices, and programs have evidence of effectiveness and what components aide in their efficacy, and conversely, what makes a program ineffective . Final products must include a PowerPoint presentation and 5-page essay in MLA format and a formal written proposal addressing the changes needed in policies, practices and programs. **Assessment:** rubric, teacher exit cards, questioning, PowerPoint, 5-page essay,	1.0, 2.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0	E 1.9, E 2.3, E 2.6, E 2.8, E 2.11, E 3.8, E 3.9
✓ **Health Advocacy:** Students will conduct a systematic public informational literature review of several community-based prevention programs. Reasons for poor performance include methodological challenges to study design and evaluation, concurrent secular trends, smaller-than-expected effect sizes, limitations of the interventions, and limitations of theories used. After in-depth exploration, students will develop a 5-lesson experiential Public Health Advocacy Curriculum that uses classroom-based activities to teach high school students about the upstream causes of health and engages them in community-based health advocacy. **Assessment:** classroom discussion, teacher observation, inside and outside circle (peer assessment)	1.0, 2.0, 4.0, 5.0, 8.0, 9.0, 10.0, 11.0	E 3.11, E 4.1, E 4.2, E 4.5, E 4.6, E 4.7, E 4.8, E 5.2, E 5.3, E 5.4, E 5.5, E 5.6, E 6.0

Unit 3: Cellular Physiology: "Exploring the World of Cellutopia" — 35 hours

Our increasing knowledge and understanding of cellular mechanisms and processes have led to great advances in all areas of biology and medicine. This unit covers genetics and evolution, cell structure, the diversity of life, and structure and function in plants and animals. Students will be introduced to the main topics in cell physiology: major components of a cell; mechanisms of cell growth and reproduction; movement of substances into and out of cells; how energy is processed within the cell; and how and why cells maintain an electrical charge across their membranes.

Standards Alignments:

CCSS: LS 11-12.1, 11-12.3, 11-12.4; **RSIT** 11.12.10; **RRLST** 11-12.1, 11-12.2, 11-12.3, 11-12.4, 11-12.7, 11-12.8, 11-12.9; **WS** 11-12.2, 11-12.4, 11-12.7, 11-12.8, 11-12.9; **WHSST** 11-12.1, 11-12.2, 11-12.3, 11-12.4, 11-12.7, 11-12.8, 11-12.9, 11-12.10
NGSS: PS 1.A, 1.B, 3.D, **LS** 1.B, 1.C, 1.D, 3.A, 3.B, 4.C, 4.D

Key Assignments	CTE Anchor Standards	CTE Pathway Standards

✓ **LAB- Growing Cells:** Students will perform culture techniques under extreme sterile (aseptic) conditions for a variety of different types of topics such as replication and transcription of DNA, protein synthesis, infection, drug action, membrane flux, cell-cell interaction, contact inhibition, and limitation of growth. Students will design and carry out experiments, interpret data and produce lab reports including written description of the procedures and their findings and illustrations . Upon completion of the series of labs, students will differentiate between biomanufacturing pharmaceuticals and chemical manufacturing and conduct an inquiry-based investigation of the factors that affect cell growth and explain their results through a scientific journal-style report. **Assessment:** demonstration, teacher observation, pre- and post- lab assessment, written report	1.0, 2.0, 4.0, 5.0, 6.0,7.0, 9.0, 10.0, 11.0X	A 2.0, A 3.0, A 4.0
✓ **LAB- Blood Experiment:** Students will examine the cellular components of fresh blood utilizing microscopes and micropipettes, to understand the immune response. Students will create a colorful, informative display that illustrates the properties of blood cells and write a detailed report of each cellular components. The lab has three major parts: Preparation; Isolation; Microscopic Observation. **Assessment:** demonstration, teacher observation, pre and post lab assessment	1.0, 2.0, 4.0, 5.0, 6.0, 7.0, 9.0, 10.0, 11.0	A 3.0, A 4.0, A 8.0
✓ **LAB- Rot:** Students will investigate the bacteria that cause soft rot on plants (grocery produce). Students will create different conditions to affect the rate of decomposition, and isolate bacteria, yeasts, and other fungi that are responsible for disease. Students will write a detailed conclusion about their observations, and will compare and contrast the experimental results. Students will also prepare a table comparing the potential uses, advantages and disadvantages of composting, recycling and landfilling. The laboratory write-up is divided into two main groups: Isolation and Koch's Postulates. **Assessment:**teachers observation, inside-outside circle, teacher check response log	1.0, 2.0, 4.0, 5.0, 6.0, 7.0, 9.0, 10.0, 11.0	A 3.0, A 4.0
✓ **LAB- Tasty Sauerkraut:** In this investigation, students will study the types of bacteria that grow during the formation of their sauerkraut, identify some characteristics of each, as well as research the types of respiratory pathways used by the organisms to break down the cabbage. Students will submit a scientific report describing the biological changes that occur to the cabbage over a period of time and relate these changes to the phenomena of diffusion and osmosis. The students will also experience the pickling process and fermentation, and will have the opportunity to taste their results. **Assessment:** peer/self assessment, written report, teacher anecdotal note cards	1.0, 20, 4.0, 5.0, 6.0, 7.0, 9.0, 10.0, 11.0	A 3.0, A 4.0, A 6.0
✓ **LAB- Fomites:** Students will grow bacteria on agar in petri dishes and sample/test various objects around campus and at home for the presence of bacteria. They will analyze their results by comparing the number and different types of bacterial colonies present. Students will examine different bacteria such as staphylococcus, E. coli, and other specimens available in the laboratory. This lab will serve as the foundation for students to further explore how bacteria infect human cells to cause disease. Students will create a display illustrating their findings about bacteria (how bacteria move, where they live, how they produce, and how bacteria can be helpful or harmful).	1.0, 2.0, 4.0, 5.0, 6.0, 7.0, 9.0, 10.0, 11.0	A 3.0, A 4.0, A 8.0

Assessment: peer/self assessment, student mind map, end of unit assessment		

Unit 4: Mental Health: "Can Normal Be Abnormal?" 40 hours

Using Framework for the 21st Century Learning (p21.org/), this unit exposes students to key terms and areas of knowledge about mental health concepts. Through research in scientific journals, psychology websites, and community resources, students will pinpoint, categorize and review the physical and emotional facets of various mental illnesses. They will examine attitudes and myths surrounding mental health and explore how stereotypes and stigma of people living with mental illness exacerbates misdiagnosis and/or lack of treatment. Students will also assess their own mental health status through personality testing and reflection and will apply these concepts to patient analysis and care. Students will also be introduced to their end-of-unit culminating project in which they will choose a mental illness to research, illustrate, and apply holistic applications from each unit of study and present their findings to the entire class.

Standards Alignments:

CCSS: LS 11-12.1, 11-12.2, 11-12.3, 11-12.4, 11-12.5; **RSIT** 11-12.1, 11-12.3, 11-12.4, 11-12.7; **RRLST** 11-12.4, 11-12.5, 11-12.6, 11-12.7, 11-12.8, 11-12.9; **WS** 11-12.2, 11-12.4, 11-12.6, 11-12.7, 11-12.8, 11-12.9; **WHSST** 11-12.1, 11-12.2, 11-12.3, 11-12.4, 11-12.5, 11-12.6, 11-12.7, 11-12.8, 11-12.9, 11-12.10

NGSS: PS 2.C, 4.C; **LS** 1.A, 1.D, 2.C, 2.D, 3.B, 4.A

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **LAB- Life Size Profiles:** In small groups, students will create a life-sized artistic representation of a mental or behavioral health professional. After researching their assigned professional, students annotate or label the X-Ray profile with the skills and dispositions needed for that profession. Professionals include: Psychiatrist, Psychiatric Nurse, Certified Alcohol and Drug Abuse Counselor, School Psychologist, Clinical Psychologist, Marriage and Family Therapist, Patient Advocate/Navigator, Youth Counselor, etc. The culminating task will be a class presentation to expose them to existing and emerging mental and behavioral health professions. **Assessment:** oral questioning, observation, exit tickets, life-size profile, gallery walk	1.0, 2.0, 4.0, 5.0, 7.0, 8.0, 9.0, 10.0, 11.0	F 1.0, F 2.0, F 4.0, F 7.0, F 1.0, F 2.0, F 7.0
✓ **Mental Health of Children and Young Adults**: In teams of 3, students will discuss specific mental diagnoses provided to them. Students will practice medical research, critical thinking, collaboration, communication, and creativity about the role of families and school staff in the context of mental health issues common to youth. Students will formulate and submit an intervention and treatment plan for the assigned diagnosis. **Assessment:** student conference, observation, gallery walk, intervention/treatment plan	1.0, 2.0, 3.0, 5.0, 7.0, 8.0, 9.0, 10.0, 11.0	F 1.0, F 4.0, F 5.0 F 6.0, F 7.0, F 8.0 F 9.0
✓ **Diagnosis in Mental Health:** Students will examine and evaluate the Diagnostic and Statistical Manual of Mental Disorders (DSM) to explore definitions, descriptions and symptoms of various mental illnesses. Students will learn how to conduct assessments of mental health to aid in diagnosis. Students will submit several proposed changes to the DSM including modifications to the definition of a mental disorder, the	1.0, 2.0, 3.0, 5.0, 7.0, 8.0, 9.0, 10.0, 11.0	F 4.0, F 6.0, F 7.0, F 9.0, F 10, F 5.0, F 8.0, F 11.0

elimination of multiaxial diagnosis, proposed changes to Personality Disorders, and diagnostic alterations involving childhood disorders, post- traumatic stress disorder, and major depressive disorder. **Assessment:** teacher questioning, quiz, quick write		
✓ **Multicultural Approaches to Mental Health:** Students will discuss mental health as it pertains to ethnic identity, gender and social class. Oppressive social factors that may contribute to mental health concerns, including racism, ageism and sexism will be examined. As students prepare for a career within the healthcare field, the will need to learn how to successfully work with individuals in unique cultural contexts. In teams, students will investigate current events and examples from recent cases where cultural sensitivity was not properly addressed. Students will analyze current policy and propose new policies to guide the creation, delivery and assessment of mental health service with a multicultural approach. Each team will present their proposals to the class for feedback and further discussion. **Assessment:** self-assessment, exit ticket, oral questioning	1.0, 2.0, 3.0, 5.0, 7.0, 9.0, 11.0	F 1.0, F 2.0, F 4.0, F 5.0, F 7.0, F .11.0
✓ **I'm a Mentor**: Each junior or senior will pick a 10th grader as a "mentee" from their home school and ask permission to coach/mentor that student throughout the semester. Mentors will meet with their mentee monthly and keep a running log documenting what strategies they have been addressing with their mentees, which goes beyond telling the student what to do, but instead provides personal examples, specific strategies to promote success at school. This assignment will allow students to place themselves back in the shoes of a 10th grader. They will identify their own triggers and needs, thus allowing them to have more empathy when talking to their mentees. Students will keep an additional personal journal of their own thoughts and feelings throughout the process. **Assessment:** interactive notebooks, self-assessment, student conference, journaling	1.0, 2.0, 5.0, 7.0, 8.0, 9,0 11.0	F 1.0, F 2.0, F 3.0, F 4.0, F 5.0, F 7.0, F 10.0, F 11.0

Unit 5: Medical Terminology: "The Living Language of Medicine" 30 hours

This unit trains students to converse more efficiently with doctors, nurses, other medical and support staff, and patients. Students will learn more about common anomalies, laboratory examinations, medical procedures, medications, and abbreviations. The basic medical terminology provided in the first semester will provide the framework needed before advancing to a more comprehensive medical terminology in the second semester, designed for students pursuing work in the medical field. This unit focus on the many components of medical terminology and how to break down a medical term by simply knowing the meaning of the root, prefix and/or suffix.

Standards Alignments:

CCSS: LS 11-12.1, 11-12.2, 11.12.3, 11-12.4, 11-12.5, 11-12.6; **RSIT** 11-12.4, 11-12.7, 11-12.8, 11-12.10; **RRLST** 11-12.1, 11-12.3, 11-12.4, 11-12.5, 11-12.6, 11-12.7, 11-12.8, 11-12.9; **WS** 11-12.2, 11-12.4, 11-12.6, 11-12.8, 11-12.9; **WHSST** 11-12.2, 11-12.3, 11-12.4, 11-12.6, 11-12.7, 11-12.8, 11-12.9, 11-12.10

NGSS: PS 1.A, 1.B; **LS** 1.B, 1.C

Key Assignments	CTE Anchor Standards	CTE Pathway Standards

✓ **Jeopardy:** Students will identify the roots, suffixes and prefixes of vocabulary used in medical offices, hospitals and other health settings. Students will review the nervous, skeletal, cardiovascular, muscle and other major systems of the human body and define and classify terms related to physiology, anatomy and pathological conditions using the context of the TV game show *Jeopardy*. Students will create their own Jeopardy boards by hand or design a PowerPoint (or like software product) presentation that functions in a similar manner and play i with the entire class. **Assessment:** word sort, oral questioning, pair share, test	1.0, 2.0, 4.0, 7.0, 9.0, 10.0, 11.0	B 1.0, B 2.0, B 4.0, B 5.0, B 6.0, B 7.0, B 10.0
✓ **Virtual Scavenger Hunt:** Students will go on a virtual scavenger hunt throughout the classroom and lab to locate pictures and definitions of the terms on their list and present their terms in a medical dictation format to the entire class demonstrating their knowledge of the terms and their definitions. **Assessment:** Student conference, exit ticket, test. peer assessment	1.0, 20, 7.0, 9.0, 11.0	B 1.0, B 5.0, B 10.0, B 12.0, B 13.0
✓ **Puzzles, Poems and Songs:** Students are assigned a set of terms and abbreviations to complete a creative writing project. To facilitate critical skills in imagery, metaphor, analogy, analysis, observation, and clear communication, students will create poems or songs utilizing medical terms. This key assignment is ongoing throughout the semester and students will keep a notebook/journal of their compositions and will be encouraged to illustrate to further cement recall. **Assessment:** quick writes, oral tests, final poems and songs, journal	1.0, 2.0, 5.0, 7.0, 8.0, 9.0, 11.0	B 1.0, B 4.0, B 5.0, B 10, B 12.0
✓ **Medical Scenarios:** Using medical scenarios provided by the instructor, students act as mock patients with symptoms while other students identify each symptom presented and diagnose their peer's "ailment." Students will also decipher the meanings of words from fictitious medical reports providing students the opportunity to hone their patient care and charting skills. Students will provide an oral and written research project to highlight their experience as a patient and caregiver. **Assessment:** student conference, self-assessment, peer assessment, exit tickets	1.0, 2.0, 3.0, 4.0, 7.0, 9.0, 11.0	B 1.0, B 2.0, B 4.0, B 10, B 12.0, B 13.0

Unit 6: Medical and Health Science Careers: "Finding My Profession Through My Passion" 40 hours

This unit provides students the opportunity to explore careers in the healthcare industry. Instruction includes the history of healthcare, in-depth study and exposure to health careers and career planning. Professionals from the community share experiences and expertise in the classroom. Students are informed about current issues in medical practice, medical ethics, new technologies and research, and societal trends. Students evaluate their own talents, interests, qualities, and educational goals while investigating the exciting, ever-changing world of health care. This unit offers students the opportunity to learn about the various health careers and the necessary training and educational requirements to become part of their chosen profession.

Standards Alignments:

CCSS: LS 11-12.4, 11-12.6, 11-12.7; **RSIT** 11-12.1, 11-12.2, 11-12.3, 11-12.8; **RRLST** 11-12.4, 11-12.8, 11-12.9; **WS** 11-12.2, 11-12.6, 11-12.8, 11-12.9; **WHSST** 11-12.12, 11-12.4, 11-12.6, 11-12.7, 11-12.8, 11-12.9
NGSS: LS 2.D,4.D

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Career Exploration:** Students will research careers related to a medical specialty area of their choice such as: Dietician, Biologist, Nurse, Researcher, Health Educator, Physician, Occupational and Physical Therapist, etc. Students will be required to research job descriptions, educational requirements, salary range, and job forecast as well as write a personal reflection. Students will present these culminating projects during Back to School Night, SVCTE Career Night and during High School and Middle School Tours. **Assessment:** teacher questioning, gallery walk, k-w-l, self reflection, peer feedback	1.0, 2.0, 3.0, 5.0, 7.0, 9.0, 11.0	B 1.0, B 2.0, B 3.0, B 5.0, B 9.0, B 11.0, B 12.0, B 13.0
✓ **Collect and Select:** Students will be asked to reflect upon their future goals and will research careers from among the 580 occupations listed in the Occupational Outlook Handbook (OOH). Students select one or more occupations and prepare a report and/or presentation addressing a series of provocative questions provided by the instructor. Each student will act out the actions of the occupation in a charades-like format until someone in the room is able to name that occupation. Students proceed to act out their occupations until someone else in the room can name the occupation. **Assessment:** self-assessment, interactive notebooks, gallery walk, observation	1.0, 2.0, 3.0, 4.0, 5.0, 9.0, 11.0	B 1.0, B 2.0, B 3.0, B 5.0, B 9.0, B 11.0, B 12.0, B 13.0
✓ **Career Informational Interview:** Students will each select someone working in a medical career related to their interest, document an interview (in person or on the phone) lasting a minimum of 20 minutes. Students will gather information about his or her career and the occupation. Students will formulate and submit a written summary of their interview questions, participant's answers and analysis of skills and abilities required in their particular career option. Students will share out their information for the class to view and discuss. **Assessment:** journaling, oral questioning, socratic seminar	1.0, 2.0, 30, 7.0, 9.0, 11.0	B 1.0, B 2.0, B 3.0, B 5.0, B 9.0, B 11.0, B 12.0, B 13.0

Unit 7: Medical Math: "Mathematics As Easy As 1, 2, 3" — 30 hours

Using candies, chocolates, and fruit juices, this unit provides an in depth exploration of mathematical calculations and will instruct the student on how to convert equivalents from one system to another and accurately mix and measure dosages. Emphasis is placed on how these techniques are used in the administration of medications for patient use. This unit involves hands on learning, required readings, assignments, and discussions. Students are highly encouraged to participate in the SkillsUSA Medical Math Competition.

Standards Alignments:

CCSS: LS 11-12.6; **RSIT** 11-12.4; **RRLST** 11-12.3, 11-12.4, 11-12.5, 11-12.8, 11-12.9; **WS** 11-12.7; **A-CED** 1, 4; **A-APR** 1, 7
NGSS: PS 1.A, 1B, 2.C, 3.D, **LS** 1.A

Key Assignments	CTE Anchor Standards	CTE Pathway Standards

Candies and Chocolates: Utilizing Skittles, M&Ms or other candies as representations of various medications, students will graphically/visually express the meaning of fractions and provide examples of each type of fraction to a peer. Students will convert improper fractions to whole and mixed numbers, fractions to decimals and decimals to fractions, percent to decimals and decimals to percent, fractions to percent and percent to fraction simulating medication management. Students will determine the dosage and timing of their administered medications and will submit a "medication sheet" with hours and dosage calculations. **Assessment:** observation, teacher questioning, quiz, peer check	1.0, 2.0, 3.0, 5.0, 6.0, 7.0, 8.0, 9.0, 11.0	A 1.0, A 2.0, A 3.0, A 5.0, A 6.0, A 7.0
Rainbow Juice: Using ratio-proportion techniques and a variety of different colored juices, students will accurately calculate dosages of simulated liquid medications from a fictitious "physician sheet." Students will decipher, calculate and dispense proper dosages. Following this exercise, student will generate 5 samples of medication orders to be displayed and evaluated by use of a "gallery walk." **Assessment:** demonstration, peer assessment, observation, test, gallery walk	1.0, 2.0, 3.0, 5.0, 6.0, 7.0, 8.0, 9.0, 11.0	A 1.0, A 3.0, A 4.0, A 5.3, A 6.0, A 8.0, A 9.0
LAB: Taking Vital Signs: Students will learn the units of measurement for temperature, pulse rate, breathing rate and blood pressure and how to read the instruments that measure them. Students will practice taking vital signs on other students. By the end of this lab, every student will be able to define all of the words in Vital Signs Vocabulary and demonstrate identification of medical equipment normally used by Healthcare professionals. Students will demonstrate proper procedures for taking a set of vital signs on a partner and accurately demonstrate that skill to the instructor in under 3 minutes. Activities will be ongoing through the semester to ensure students meet rigorous learning objectives. **Assessment:** observation, demonstration, self-assessment, exit ticket, test	1.0, 2.0, 3.0, 5.0, 6.0, 7.0, 8.0, 9.0, 11.0	A 1.0, A 3.0, A 4.0, A 5.0, A 6.0, A 8.0, A 9.0

Unit 8: Psychology of Child, Elderly, Family, & Community: "Mind Is Your Greatest Resource" 37 hours

This unit explores the study of human development through childhood, adolescence, adulthood and old age, within the psychosocial lens of family, school, and community. Bidirectional effects and interactions among these spheres of life will be explored. Age, gender, diverse abilities, ethnicity, socioeconomics, and public factors that affect development of values, attitudes, morals, and behavior of children, youth, adults and the elderly will be considered within a psychological and/or sociological framework.

Standards Alignments:

CCSS: LS 11-12.1, 11-12.4, 11-12.6; **RSIT** 11-12.1, 11-12.4, 11-12.7, **RRLST** 11-12.5, 11-12.8, 11-12.9; **WS** 11-12.2, 11-12.4, 11-12.7; **WHSST** 11-12.1, 11-12.5, 11-12.9

NGSS: PS 1.B, 2.C, 3.D; **LS** 1.A, 1.B, 1.D, 4.D

Key Assignments	CTE Anchor Standards	CTE Pathway Standards

✓ **Life of 8:** Using a variety of media sources, students will examine the eight stages of human emotional and psychological development described by Erik Erikson and other psychologists and discuss the different theories pertaining to stages of life, infancy through adolescence, with a focus on the adolescent identity crisis. In small groups, students will develop and present a brief presentation to the class about a specific theory chosen by the student. **Assessment:** observation, gallery walk, student conference, quiz	1.0, 2.0, 4.0, 5.0, 6.0, 8.0, 10.0, 11.0	F 1.0, F 2.0, F 4.0, F 6.0, F 7.0, F 9.0, F 10.0, F 11.0
✓ **Live Well, Age Well:** Students will learn the special psychosocial needs of the elderly and strategies that can be used to help caregivers give person-centered care. Students will explore how the use of these strategies can make an elderly person happier and healthier — and make them feel better about themselves. Students will create posters for a gallery walk illustrating changes from newborn to elderly and describe life elements necessary for successful professional and personal growth. **Assessment:** journaling, word sort, quiz, gallery walk posters	1.0, 2.0, 4.0, 5.0, 6.0, 8.0, 10.0, 11.0	F 1.0, F 3.0, F 7.0, F 8.0, F 9.0, F 12.0

Unit 9: Nutrition: "Energize and Revitalize your Health with Food" — 30 hours

Students will perform analysis and application of the principles of food preservation, including drying, canning, freezing, pickling, and preserving with sugar, as well as the study of microbiological aspects, with an emphasis on food safety. Students will explore the role of nutrition and food throughout the life cycle in relationship to the maintenance of health, prevention of diseases, and correction of disorders due to nutritional imbalance, and the physiology and etiology of disease states and their nutritional management. Emphasis on food requirements for different individuals, nutritive values of food, diet planning, and the relation of food to positive health is also covered.

Standards Alignments:

CCSS: LS 11-12.1, 11-12.3, 11-12.4, 11-12.6; **RSIT** 11-12.1, 11-12.4, 11-12.7, **RRLST** 11-.12.4, 11-12.8, 11-12.9, **WS** 11-12.2
NGSS: PS 1.A, 1.B, 3.D; **LS** 1.A, 1.B, 4.D

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Genetic Engineered Food:** Students will investigate the science of genetic modification, pros and cons of genetic modifications, food that is commonly genetically modified, useful features and concerns. Students will research the pros and cons, develop a position, record their opinions on a graphic organizer and write a persuasive essay arguing for their position. Students will share their viewpoints, concerns and the variety of opinions that exist through discussion, debate and oral presentations. Students will be able to compare genetically modified foods benefits and concerns in a PowerPoint presentation. **Assessment:** pair share, observation, journaling	1.0, 2.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0	E 1.0, E 2.0 E 4.0, E 5.0, E 6.0, F 8.0
✓ **LAB: Foodborne Illness:** Students will identify microorganisms that are harmful to the human body and microorganisms that cause foods to spoil. Students will demonstrate an understanding of food science and	1.0, 2.0, 4.0, 5.0, 6.0, 7.0, 9.0, 10.0, 11.0	E 1.0, E 2.0, E 3.0, E 4.0,

food safety procedures. Students will experiment on bacterial growth, analyze and determine the types of bacteria and submit an in-depth report of their observations. **Assessment:** observation, journaling, lab reports, test		E 5.0, E 6.0, E 7.0
✓ **LAB- SuperTracker Nutrition:** Students will enter 3 days of their own food consumption into the USDA SuperTracker website (supertracker.usda.gov) and analyze the results. Students will compare this data with suggested numbers to analyze the healthiness of their own diet. Students will print and submit their recorded data and discuss their strengths and possible areas of dietary improvement. **Assessment:** SuperTracker report, self-assessment, journaling, student conference	1.0, 2.0, 4.0, 5.0, 6.0, 7.0, 90, 10.0, 11.0	E 1.0, E 2.0 E 4.0, E 5.0, E 6.0, E 7.0, F 8.0
✓ **LAB- Creating My Beverage:** This hands on unit prepares the student to create several recipes, but also learn how to properly prepare food. Utilizing a blender, fruit, vegetables, seeds, juice and water, students will create a healthy and tasty beverage. Students will analyze the nutritional content and the amount of carbohydrates, fats and protein in the beverage they created. Students will submit a thorough report of the nutritional content of their recipes and its benefits for good health. **Assessment:** observation, pair share, beverage nutritional report, exit ticket	1.0, 2.0, 4.0, 5.0, 6.0, 7.0, 9.0, 10.0, 11.0	E 1.0, E 2.0, E 3.0, E 4.0, E 5.0, E 6.0, E 7.0

Unit 10: Biomedical Ethics: "Assessing Humanity's Ethics" 20 hours

This unit examines the ethical and social issues surrounding the practice of medicine, in particular the relationship between research subjects, patients and health care providers. This unit aims both to provide a forum for the discussion and debate of issues in bioethics, and to contribute to ethical solutions for problems and challenges in clinical practice, research and public policy.

Standards Alignments:

CCSS: LS 11-12.1, 11-12.2, 11-12.3, 11-12.4, 11-12.6; **RSIT**, 11-12.4, 11-12.7, 11-12.8,11-12.10; **RRLST** 11-12.2; **WS** 11-12.2, 11-12.6, 11-12.8, **WHSST** 11-12.6, 11-12.7, 11-12.9
NGSS: LS 2.D, 4.D

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Current Events:** Students will read "Bioethical Scenarios" from the *New York Times*. Students will work in collaborative groups of 3 discussing each scenario. In the groups, each student will take a role: reader, recorder, and reporter. Each group will deliver an in-depth report to the entire class exploring the different bioethical issues pertaining to each scenario and leading a class discussion and debate. **Assessment:** gallery walk, pair share, word sort, teacher observation of oral reports and discussions	1.0, 2.0, 3.0, 5.0, 6.0, 7.0, 9.0, 1.01	B 1.0, B 2.0, B 4.0, B 5.0, B 6.0, B 7.0
✓ **Medical Ethics:** Essential topics for anyone considering a career in the medical profession are: understanding professional liability in the current healthcare environment; encounters associated with healthcare decision-making and end-of-life care; and new concerns arising from evolving populations, technologies, and systems of care. Student teams will be provided with a variety of scenarios/complete case studies. Each team	1.0, 2.0, 3.0, 5.0, 7.0, 9.0, 11.0	B 1.0, B 3.0, B 7.0, B 10.0, B 13.0

will discuss their cases, take a complete set of notes on each case, and debate ethical issues including the physician-patient relationship, covering dignity, confidentiality and care. **Assessment:** quick write, oral questioning, K-W-L		
✓ **Research Ethics:** Students will submit a research paper on their area of interest, a minimum of 7 pages in APA format. Students will engage in reading assignments, lectures, discussions and practical review of research protocols. Topics include: history of human subject protections; regulatory and ethical frameworks for biomedical research; informed consent theory and application; selection of fair research subjects and payment; confidentiality; secondary uses of data and stored tissue; ethics of international research; pediatric and genetic research; and conflicts of interest in biomedical research. **Assessment:** teacher observation, written report, student conference, exit tickets	1.0, 2.0, 3.0, 4.0, 7.0, 11.0	B 1.0, B 2.0, B 4.0, B 5.0, B 6.0, B 7.0

Unit 11: Internship: "From Books to Real World" — 160 hours

During their internship, students will have the opportunity to participate in multiple projects and interact with may healthcare professionals in a hospital or clinic. Student internships are designed to be completed in a hospital, extended care facility, rehabilitation center, medical office, imagery laboratory, or other health care or research facility. Requirements must be met and cleared by the instructor prior to internship placement.

Standards Alignments:

CCSS: LS 11-12.1, 11-12.2, 11-12.3, 11-12.4, 11-12.5; **RSIT** 11-12.7, 11-12.10, 11-12.1, 11.12.2; **RRLST** 11-12.7, 11-12.8, 11-12.9; **WS** 11-12.2, 11-12.6, 11-12.8; **WHSST** 11-12.5, 11-12.8, 11-12.9

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Chain of Command and Codes:** Students will explore the chain of command in their workplaces as they rotate departments, empowering them to solve problems at work as needed, and seek out appropriate challenges rather than avoiding them. Students will study the organizational structure of the workplace and discuss the relationships observed, enabling students to comprehend the organizational structure in healthcare organizations. Students will also construct a healthcare delivery system model with a simulated organizational chart diagramming the interdependence of healthcare professions within a system. Students will keep a log/journal of their experience during their internship and will have regular conferences with instructor to self-reflect on the experience and receive meaningful feedback. **Assessment**: journaling, oral questioning, Socratic seminars	1.0, 2.0, 3.0, 5.0, 9.0, 11.0	B 1.0, B 2.0, B 4.0, B 5.0

✓ **Professional Development**: Integrated throughout the internship experience are career preparation standards, which include basic academic skills, communication skills, interpersonal skills, problem solving, workplace safety, technology, and employment literacy. Students will develop personal goals as they relate to college and careers. Students will fill out "Personal Inventory" worksheets and discuss and compare students' goals with what other students suggest. Students will create a report of the average ranking of each item on the "Personal Inventory" worksheet and compare personal results with group averages. **Assessment:** self-assessment, K-W-L, exit ticket		B 1.0, B 2.0, B 4.0, B 6.0, B 13.0
✓ **Coworker interview**: Students interview a professional or mentor at their internship sites, crafting a narrative of this person's college and career path. Professional interviews are generated every two weeks from student internship rotation. Students will deliver their findings and discuss them in class through a PowerPoint presentation and report. **Assessment:** oral questioning, K-W-L, PowerPoint slideshow, written report, journaling	1.0, 2.0, 3.0, 5.0, 9.0, 11.0	B 1.0, B 2.0, B 3.0, B 6.0, B 11.0, B 13.0
✓ **Is It Worth the Investment?** Students will identify steps to secure financial assistance for postsecondary education and training. Using the OK Career Guide (okcareerguide.kuder.com) to investigate the location of educational institutions and the costs of education/training for the career; students must explore at least 3 options that vary the price of training, *e.g.* career and technology training in high school, two years of postsecondary career and technology school or community college, private vs. public education, and four-year colleges and universities. Students will complete both written and oral reports comparing the education/training options investigated. **Assessment:** journaling, teacher questioning, written and oral reports, exit ticket	1.0, 2.0, 3.0, 4.0, 5.0, 7.0, 9.0, 11.0	B 1.0, B 2.0, B 5.0, B 6.0, B 7.0, B 8.0, B 11.0

Unit 12: Portfolio "My Personal Organizer" — 5 hours

Students will demonstrate creativity in order to expand on and exhibit their skills, knowledge, projects and experiences. Students will create a multi-faceted portfolio to exhibit their skills, knowledge, accomplishments, goals, aspirations, and personal thoughts, to showcase themselves to potential employers and organizations. It will also provide tangible proof of their skills and abilities and demonstrates to the employer that he/she is qualified for a specific job.

Standards Alignments:

CCSS: LS 11-12.1, 11-12.2, 11-12.3. 11-12.4, 11-12.6; **RSIT** 11-12.10; **RRLST** 11-12.2, 11-12.4; **WS** 11-12.2, 11-12.6, 11-12.7

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Personal website**: Students can select from Weebly, Webs, Wix, or Google Sites to build their personal e-portfolio website, which students will be using for job search and/or future college and careers. Students will present their portfolio in class.This portfolio will include a resume, letters of reference and certifications.	1.0, 2.0, 3.0, 4.0, 5.0, 9.0, 10.0, 11.0	B 1.0, B 2.0, B 4.0, B 7.0, B 8.0,

Assessment: observation, portfolio check, teacher questioning		B 10.0, B 11.0, B 12.0

Unit 13: Bloodborne Pathogens, CPR, AED and Essential First AID — 15 hours

Students will be introduced to bloodborne pathogens and how to protect themselves and others from being exposed to blood or blood-containing materials. Students will learn emergency first aid and techniques. Students acquire knowledge and skills necessary for dealing with emergencies within the athletic setting.

Blood Borne Pathogens

- How to react in an emergency
- Contacting 911
- Legal issues
- What are bloodborne pathogens
- Means of transmission
- Prevention of bloodborne pathogens
- Universal precautions
- Exposure control plan
- The Use of biohazard labels and container color coding
- Hepatitis B vaccine
- Engineering Controls
- Post exposure follow-ups

CPR/AED

- How to react in an Emergency
- Contacting 911
- Overview of the AED and its use
- The Chain of survival
- Medical and legal issues
- The AED/CPR algorithm
- Preparing and managing the AED event
- AED troubleshooting service, and maintenance
- Signs, symptoms, care of heart attack
- Signs, symptoms, care of stroke
- CPR for people age 8 and older
- CPR for people age 1- 8
- CPR for infants up to 1-year old

Essential First Aid

- First aid
- Burn Care (thermal, chemical and electrical)
- Musculoskeletal
- Stroke
- Diabetic emergencies
- Seizures
- Asthma attacks
- Anaphylactic shock
- Heat emergencies
- Heimlich maneuver for all ages

Standards Alignments:

CCSS: RSIT 11-12.7, **RRLST** 11-12.3
NGSS: PS 1.A, 1.B; **LS** 1.B

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Blood Borne Pathogen:** Students will participate in a Blood Borne Pathogen (BBP) training. After successful completion of this training, students will understand what BBP are and how risks of exposure can be reduced for themselves and others, and will receive a Certification which adheres to the training requirements of the U.S. Department of Labor, Occupational Safety & Health Administration (OSHA) Bloodborne Pathogens Standard (29 CFR 1910.1030). **Assessment:** questioning, self assessment, certification test, exit ticket	2.0, 6.0, 11.0	B 10.3, B 11.4, B 12.4

✓ **CPR/AED:** Students will participate in CPR/AED training that satisfies OSHA requirements and leads to certification upon successful completion. Course covers Infant, Child, and Adult CPR. Students will engage in hands-on practice with a CPR/AED trainer. **Assessment:** pair share, certification test, oral defense	2.0, 6.0, 10.0, 11.0	B 12.4
✓ **First Aid Training:** Students will participate in First Aid Training which covers the recognition and treatment for illness and injuries. This class satisfies OSHA requirements.Upon successful completion of the course, students will receive a First Aid Certification card. **Assessment:** oral questioning, student demonstration, peer assessment, certification test	2.0, 6.0, 10.0, 11.0	B 10.3, B 12.4

Instructional Materials

Textbooks:	**Electronic Media/Supplemental Print Materials/Online Resources:**
Essentials of Human Anatomy & Physiology 11th edition Elaine N. Marieb - Pearson Publisher © 2015 ISBN: 978-00-321-91900-7 ***Diversified Health Occupations 7th edition*** Louise Simmers, Karen Simmers & Sharon Simmers - Delmar Cengage Learning Publisher © 2009 ISBN: 13:978-1-4180-3021-6 ***Emergency Care and Transportation of the Sick and Injured 8th edition*** Bruce D. Browner, Andrew N. Pollak & Carol L. Gupton - Jones and Bartlett Publisher © 2002 ISBN: 0-7637-1666-9 ***Dean Vaughn Medical Terminology 350 Learning Guide*** DCM/Instructional Systems © 1988 ISBN 0-914901-06-0	Center for Disease Control and Prevention: www.cdc.gov Nutrition: https://www.nutrition.gov, www.supertracker.com New England Journal of Medicine: www.nejm.org Department of Health: http://www.doh.gov.ph/ Department of Health: http://www.health.ri.gov Department of Labor and Employment: http://www.dole.gov.ph/ Department of Science and Technology: http://www.dost.gov.ph/ US Department of Health & Human Services: https://www.ahrq.gov/ National Institute of Mental Health: https://www.nimh.nih.gov

Standards Assessed in this Course

CTE Anchor Standards:

1.0 Academics: Academics standards are aligned to pathways; see below.

2.0 Communications: Acquire and use accurately sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

3.0 Career Planning and Management: Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

4.0 Technology: Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the sector workplace environment.

5.0 Problem Solving and Critical Thinking: Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

6.0 Health and Safety: Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the sector workplace environment.

7.0 Responsibility and Flexibility: Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the sector workplace environment and community settings.

8.0 Ethics and Legal Responsibilities: Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

9.0 Leadership and Teamwork: Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution.

10.0 Technical Knowledge and Skills: Apply essential technical knowledge and skills common to all pathways in the sector following procedures when carrying out experiments or performing technical tasks.

Health Science & Medical Technology Sector — Pathway Standards:

B. 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.

B 2.0 Understand the basic structure and function of the human body and relate normal function to common disorders.

B 2.1 Know basic human body structure and function in relationship to specific care between prevention, diagnosis, pathology, and treatment.

B 2.2 Describe basic stages of growth and development.

B 2.3 Recognize common disease and disorders of the human body.

B 2.4 Compare normal function of the human body to the diagnosis and treatment of disease and disorders.

B 3.0 Know how to apply mathematical computations used in health care delivery system.

B 3.2 Analyze diagrams, charts, graphs, and tables to interpret health care results.

B 4.0 Recognize and practice components of an intake assessment relevant to patient care.

B 4.4	Collect and synthesize information or data about the patient's symptoms and vital signs.
B 4.5	Evaluate information gathered and connect patient data to appropriate system of care.
A.	**Biotechnology Pathway Standards:**
	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.
A 3.0	**Demonstrate competencies in the fundamentals of molecular cell biology, including deoxyribonucleic acid (DNA) and proteins and standard techniques for their purification and manipulation.**
A 3.1	Define and describe the structure and function of DNA ribonucleic acid (RNA) and proteins, explain the consequences of DNA mutations on proteins.
A 3.2	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.
A 3.3	Employ standard techniques of DNA extraction, purification, restriction digests, bacterial cell culture, and agarose gel electrophoresis and document and evaluate results.
A 3.4	Employ standard protein techniques, including antibody production, enzyme assays, spectrophotometry, gel electrophoresis, and chromatography and document and evaluate results.
A 3.5	Predict outcomes of DNA and protein separation protocols.
A 4.0	**Recognize basic concepts in cell biology and become familiar with the laboratory tools used for their analysis.**
A 4.1	List and describe the structure and function of cellular organelle.
A 4.2	Describe conditions that promote cell growth under aseptic conditions in the laboratory and workplace. A4.3 Use various methods to monitor the growth of cell cultures.
A 4.4	Explain the basic concepts of cell growth and reproduction, DNA replication, mitosis, meiosis, and protein synthesis.
A 4.5	Discuss the structure and function of the macromolecules that compose cells, including carbohydrates, lipids, DNA, RNA, and protein molecules.
A 4.6	Distinguish between prokaryotic cells, eukaryotic cells, and viruses.
A 4.7	Conduct indicator tests for the common macromolecules of the cell.
A 8.0	**Follow sustainable and safe practices with high regard for quality control.**
A 8.1	Follow written protocols and oral directions to perform a variety of laboratory and technical tasks.
A 8.2	Recognize laboratory safety hazards using safe practices to avoid accidents.
A 8.3	Locate and use Material Safety Data Sheets (MSDS).
A 8.4	Outline the appropriate responses to a laboratory accident including identification of location and use of emergency equipment.
A 8.5	Practice laboratory and personal safety including the location and use of emergency equipment (personal protective equipment, no food or drink, no open-toe shoes).
A 8.6	Properly and safely use and monitor a variety of scientific equipment, including pH meters, microscopes, spectrophotometers, pipets, micropipets, and balances.

A 8.7 Determine which equipment is appropriate to use for a given task and the units of measurement used. A8.8 Perform specimen collection, label samples, and prepare samples for testing. A8.9 Handle, transport, and store samples safely.

Public and Community Health Pathway Standards:

The standards for the Public and Community Health pathway apply to occupations or functions involved primarily in environmental health, community health and health education, epidemiology, disaster management, and geriatrics. The standards specify the knowledge and skills needed by professionals pursuing careers in this pathway.

E 1.0 Understand the context and scope of public health on improving health and quality of life in personal, community, and the global population.

E 1.3 Identify the roles and responsibilities of public health in addressing populations, health disparity, and disaster prevention and management.
E 1.4 Explain how public health can utilize health information and health communications to improve the health of populations.
E 1.5 Explain how public health can utilize social and behavioral interventions to improve the health of populations.
E 1.6 Explain how public health can utilize health policy and law to improve the health of populations.
E 1.7 Explain how public health assesses the options for intervention to improve the health of a population.
E 1.8 Explain the impact of the environment and communicable diseases on the health of populations.
E 1.9 Compare the scope of current public health policies with past practices.
E 1.10 Defend health decisions, individual rights, and social responsibilities.

E 2.0 Design, promote, and implement community health programs which result in health-positive behaviors among all individuals, families, groups in a community, and the global environment.

E 2.1 Know public policies that have an impact on people's health.
E 2.2 Identify and document factors influencing people's health status through a strong grounding in social and behavioral theory.
E 2.3 Understand various strategies to improve the health status of individuals and the community.
E 2.4 Understand the many health disparities barriers to access among underserved communities.
E 2.5 Develop specific competencies for work in underserved and/or linguistically isolated communities.
E 2.6 Demonstrate competency in working with diverse cultures and communities.
E 2.7 Demonstrate ways in which enhancing and maintaining personal health and well-being are established.
E 2.8 Explain fiscal and organizational resources to ensure optimal health programs and service delivery in communities.
E 2.9 Expand health knowledge to provide information and referrals and advocacy on a range of health topics more effectively.
E 2.10 Conduct outreach and health education at community sites with various cultural groups.
E 2.11 Evaluate the process and outcome of community-based health education programs.
E 2.12 Research the social, cultural, and behavioral factors influencing health outcomes.

E 3.0 Examine gerontology and its social implications using a lifespan perspective that focuses on older adults' needs/concerns along life's continuum in various environments.

E 3.1 Understand how the demographics of the older population affect various aspects of our society.
E 3.2 Recognize the contributions that aging persons make to their communities.
E 3.3 Define the life course perspective and describe how age, gender, race, and ethnicity influence the life course.

E 3.4	Identify a range of available services for elders in most communities.
E 3.5	Understand health disparities among older adults and their impact on society.
E 3.6	Understand the role of service providers and the use of community recreation and health services in their involvement with older persons.
E 3.7	Understand common threats to loss of independence: falls, medication management, and lifestyle.
E 3.8	Advocate for technology to enhance older adults' function, independence, and safety.
E 3.9	Assess how policies, regulations, and programs differentially impact older adults and their caregivers, particularly among historically disadvantaged populations.
E 3.10	Differentiate between normal changes in functioning due to aging and pathological changes leading to disease.
E 3.11	Analyze the impact of an aging society on the nation's health care system.
E 4.0	**Promote the protection, sustainability, and enhancement of the overall environmental quality of life.**
E 4.1	Identify the various environmental factors that affect a community's health and safety such as water quality, air quality, food supply, industrial hygiene, and solid and hazardous waste disposal.
E 4.2	Identify human health hazards that may cause sickness or impaired health/well-being.
E 4.3	Identify the carriers or vectors that promote the transfer of these agents from the environment to the human.
E 4.4	Interpret the principles of environmental health practices.
E 4.5	Summarize health conditions that are caused or aggravated by environmental conditions.
E 4.6	Discuss emerging global environmental health problems.
E 4.7	Analyze current legislation and regulation regarding environmental issues.
E 4.8	Explore approaches to control major environmental health problems.
E 5.0	**Predict and evaluate rates, risk factors, and health status indicators of morbidity and mortality, disease determinants, and causation.**
E 5.2	Describe the basic epidemiological concepts of rates, causation, and public health surveillance.
E 5.3	Generate hypotheses of patterns of disease and injuries regarding person, place, and time.
E 5.4	Research data regarding disease or injuries, including rates, risk factors, disease determinants, and causation of morbidity and mortality.
E 5.5	Explore the effects of disease, injury, and violence on longevity and quality of life.
E 5.6	Evaluate methods to prevent, detect, cure, and minimize disease, injury, and violence in the population.
E 6.0	**Integrate knowledge and skills necessary as a member of a Community Emergency Response Team (CERT) to demonstrate the response required to meet your community's immediate needs in emergencies or disasters.**
E 6.1	Describe the roles and responsibilities of a member of a Community Emergency Response Team (CERT) in immediate response.
E 6.2	Describe potential hazards and their effect on the community.
E 6.3	Describe prevention strategies in homes, workplaces, and communities.
E 6.4	Identify planning and size-up requirements for potential search and rescue situations.
E 6.5	Explain how the community has a role in disaster preparedness and response.
E 6.7	Employ basic assessment, triage, and treatment as defined by CERT protocols under simulated disaster conditions.
E 6.8	Demonstrate working as a team, applying safe techniques for debris removal, and victim extrication.
E 6.9	Describe the post-disaster emotional environment and the steps that rescuers can take to relieve their own stressors and trauma and those of disaster survivors.

Mental and Behavioral Pathway Standards:

F 1.0 Recognize and interpret principles of community engagement.

F 1.1 Identify and describe prevention and early intervention barriers to mental health care.

F 1.2 Define the psycho-educational approach and describe how it is used as a tool to help consumers and their families learn more about managing their mental illness.

F 1.3 Define the principles of community engagement and how they apply to community- based participatory research.

F 1.4 Use and apply community-based participatory research methods to increase community participation and resources.

F 1.5 Develop and explore basic outreach approaches that can be successful in increasing awareness about mental health services.

F 1.6 Research and organize community resources that promote community wellness.

F 1.7 Advocate community inclusion and social roles such as; supported housing, employment, education, parenting, citizenship, and anti-stigma.

F 2.0 Demonstrate the ability to build relationships by communicating empathy.

F 2.1 Describe the elements of active listening.

F 2.2 Demonstrate active listening by connecting new knowledge or experiences with prior knowledge and problem solving.

F 2.3 Differentiate between giving advice and active listening by constructing real-life examples.

F 2.4 Build strong verbal knowledge to frame language in ways that increase engagement.

F 2.5 Recognize complex language semantics and make appropriate adaptations for the community being served.

F 2.6 Build on communication by using motivational interviewing as an engagement tool.

F 3.0 Develop and employ collaboration skills that engage others and build trust.

F 3.1 Define collaboration in a mental health context and build on prior knowledge by recalling collaborative experiences.

F 3.2 Employ aspects of collaborative leadership that enhances decision making and consensus building.

F 3.3 Explore and practice collaborative methods for working with special populations to increase their community capacity.

F 3.4 Design innovative strategies to monitor and evaluate engagement.

F 4.0 Recognize and differentiate between the stages of mental health recovery.

F 4.1 Define four stages of mental health recovery (hope, empowerment, self-responsibility, and meaningful role in life) and demonstrate impact on complex mental health problems.

F 4.2 Demonstrate the ability to formulate goals related to each of the four stages of recovery using a multiple-step process of goal setting.

F 4.3 Compare and contrast a psychosocial rehabilitation and recovery model that supports each individual's potential for recovery verses a medical model that views abnormal behavior as the result of physical problems and should be treated medically.

F 4.4 Integrate and apply four stages of recovery by designing a recovery plan based on goals that require real-world scenarios.

F 4.5 Assess the implementation of the recovery plan and formulate alternative approaches to reach desired outcomes.

F 4.6 Advocate for hope and respect, and believe that all individuals have the capacity for learning and growth.

F 4.7 Examine ways in which one's recovery from mental illness can be measured.

F 5.0 Communicate and practice leadership and accountability behaviors.

F 5.1 Identify strategies to work under pressure and cope with stress.

F 5.2	Develop a basic understanding of various leadership styles that promote positive change in mental health services.
F 5.3	Compare and contrast different leadership styles and accountability in mental health.
F 5.4	Construct multiple steps to solve complex problems using real-world scenarios in mental health services.
F 6.0	**Analyze and interpret elements of positive psychology (e.g., hope, resilience, strengths, creativity, community building, and supportive spirituality).**
F 6.1	Recall the recovery model and communicate how positive psychology impacts a mental health consumer's recovery.
F 6.2	Interpret key terms from the positive psychology perspective in relationship to holistic wellness.
F 6.3	Assess the impact of positive psychology's elements on risk reduction and integrated primary care.
F 6.4	Build on the discovered strengths and capabilities of individuals.
F 7.0	**Formulate and implement quality care and treatment plans.**
F 7.1	Define and describe practices that help individuals improve the quality of all aspects of their lives, including social, occupational, educational, spiritual, and financial.
F 7.2	Identify and provide evidence for an effective collaborative approach in mental health recovery that is inclusive of the individual in need.
F 7.3	Practice promoting health and wellness, encouraging individuals to develop and use individualized wellness plans.
F 7.4	Design a treatment plan that addresses the unique needs of individuals, consistent with their values, hopes and aspirations.
F 7.5	Adhere to consistent documentation of implemented interventions and progress.
F 8.0	**Synthesize, understand, and predict the impact of mental health disparities across consumer populations.**
F 8.1	Define mental health disparities.
F 8.2	Organize and summarize knowledge on the impact of mental health disparities among different populations.
F 8.3	Analyze causes for mental health disparities using current research methods and literature.
F 8.4	Synthesize research articles related to mental health disparities and produce a statement problem on what causes such disparities.
F 9.0	**Design a practice model of a personal support network by utilizing prior knowledge of recovery concepts and using natural supports within communities.**
F 9.1	Identify community-based self-help/peer support groups.
F 9.2	Communicate with self-help/peer support groups in the community and generate information about their specific functions and responsibilities to the community they serve.
F 9.3	Compare and contrast self-help/peer support groups to determine strengths and gaps in service delivery.
F 9.4	Design a practice self-help/peer support group model that fills in the identified gaps and builds on the identified strengths.
F 9.5	Examine the role that natural supports such as spiritual organizations, community centers, and other community-related resources play in an individual's mental health recovery.
F 10.0	**Formulate an argument and predict how electronic health records can transform quality of care and promote a green economy.**
F 10.1	Access and become familiar with basic electronic health records functions.
F 10.2	Analyze the effect of electronic health records on the quality of care and a green economy.
F 10.3	List and describe at least five ways that electronic health records will advance a green economy.

F 10.4 Distinguish between interoperability at the local primary care level and interoperability with statewide mental health systems in using electronic health records.

F 11.0 Recognize and respect the various cultures of a community and other factors that indicate its diversity in all aspects of communicating, designing, and implementing patient care.

F 11.1 Identify and understand the patterns of communication including the use of languages. F11.2 Communicate and listen effectively across cultures and all levels of care.

F 11.3 Demonstrate appropriate judgment on when and how to use trained interpreters.

F 11.4 Research factors that define cultural differences between and among different ethnic, racial, and special populations.

F 11.5 Illustrate how to incorporate culturally appropriate community resources.

F 11.6 Design and execute an ethnographic approach focusing on information retrieval, observing social behavior, managing stress and time, ask questions, explore aspects of global significance, and analyze data using relevant concepts.

F 12.0 Evaluate the purpose and components of a treatment plan related to the consumer's health status.

F 12.1 Understand the roles of a patient advocate to ensure treatment quality and resources. F12.2 Explain the components of a treatment plan.

F 12.3 Select appropriate equipment and instruments in accord with the treatment plan.

F 12.4 Adhere to the roles and responsibilities, within scope of practice, that contribute to the design and implementation of a treatment plan.

F 12.5 Prioritize and organize work in accordance with the patients' treatment plans.

F 12.6 Determine the resources available for the effective implementation of treatment plans for patients.

F 13.0 Identify and apply leadership styles in personal growth and development. F13.1 Develop goal setting that leads to professional and career growth.

F 13.2 Participate in student leadership and skill development activities such as California Health Occupations Students of America (Cal-HOSA).

F 13.3 Employ self-regulation strategies that include self-monitoring and self-evaluation in approaching new and challenging tasks.

F 13.4 Build and employ self-confidence to empower self and others. F13.5 Refine and upgrade technical and clinical skills.

F 13.6 Create and design a working portfolio that will be used for interviews for both post-secondary and employment acceptance.

Common Core State Standards:

Language Standards – LS – (Standard Area, Grade Level, Standard #)

LS 11-12.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

LS 11-12.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

LS 11-12.3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

LS 11-12.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies.

LS11-12.5	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.
LS 11-12.6	Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
Reading Standards for Informational Text – RSIT – (Standard Area, Grade Level, Standard #)	
RSIT 11-12.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
RSIT 11-12.3	Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.
RSIT 11-12.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.
RSIT 11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
RSIT 11-12.8	Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., *The Federalist,* presidential addresses).
RSIT 11-12.10	By the end of grade 11, read and comprehend literary nonfiction in the grades text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11-CCR text complexity band independently and proficiently.
Reading Standards for Literacy in Science and Technical Subjects – RRLST – (Standard Area, Grade Level, Standard #)	
RLST 11-12.1.	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes to any gaps or inconsistencies in the account.
RLST 11-12.2.	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RLST 11-12.3.	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RLST 11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
RLST 11-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
RLST 11-12.6.	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
RLST 11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RLST 11-12.8.	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RLST 11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Writing Standards – WS – (Standard Area, Grade Level, Standard #)	
WS 11-12.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
WS 11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WS 11-12.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WS 11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WS 11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the on any one source and following a standard format for citation including footnotes and endnotes.
WS 11-12.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
Writing Standards for Literacy in History/Social Studies, Science and Technical Subjects – WHSST – (Standard Area, Grade Level, Standard #)	
WHSST 11-12.1.	Write arguments focused on discipline-specific content.
WHSST 11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHSST 11-12.3	Incorporate narrative elements effectively into arguments and informative/explanatory texts.
WHSST 11-12.4	Produce clear and coherent writing in which the development, organization, and A1.0 style are appropriate tot task, purpose, and audience.
WHSST 11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHSST 11-12.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHSST 11-12.7.	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHSST 11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

WSHSS 11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
WSHSS 11-12.10	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Math Standards – Algebra – A-SSE – Seeing Structure in Expressions (Standard Area, Grade Level, Standard #)

A-CED 1	Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.
A-CED 4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

Math Standards – Algebra – A-APR – Arithmetic with Polynomials and Rational Expressions (Standard Area, Grade Level, Standard #)

A-APR 1.	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication: add, subtract, and multiply polynomials, and divide polynomials by monomials. Solve problems in and out of context.
A-APR 7	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

California History/Social Science Standards:

Principles of American Democracy and Economics – AD

AD 12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.

Next Generation Science Standards:

Scientific and Engineering Practices

SEP 1	Asking questions (for science) and defining problems (for engineering)
SEP 2	Developing and using models
SEP 3	Planning and carrying out investigations
SEP 4	Analyzing and interpreting data
SEP 5	Using mathematics and computational thinking
SEP 6	Constructing explanations (for science) and designing solutions (for engineering)
SEP 7	Engaging in argument from evidence
SEP 8	Obtaining, evaluating, and communicating information

Disciplinary Core Ideas: Life Sciences

LS 1.A	From Molecules to Organisms: Structure and Function
LS 1.B	From Molecules to Organisms: Growth and Development of Organisms
LS 1.C	From Molecules to Organisms: Organization for Matter and Energy Flow in Organism
LS 1.D	From Molecules to Organisms: Information Processing
LS 2.C	Ecosystems: Ecosystems Dynamics, Functioning, and Resilience
LS 2.D	Ecosystems: Social Interactions and Group Behavior

Crosscutting Concepts

CC 4. Systems and System Models

LS 3	Heredity: Inheritance and Variation of Traits
LS 4.A	Biological Evolution: Evidence of Common Ancestry and Diversity
LS 4.B	Biological Evolution: Natural Selection
LS 4.D	Biological Evolution: Biodiversity and Humans
ETS 2.A	Interdependence of Science, Engineering, and Technology
PS 1	Structure and Properties of Matter
PS 3.A	Energy: Definitions of Energy
PS 3.C	Energy: Relationship Between Energy and Forces
PS 3.D	Energy: Energy in Chemical Processes and Everyday Life
PS 4.C	Waves and Their Applications in Technologies for Information Transfer: Information Technologies and Instrumentation