



HEALTH SCIENCE 3 - 5552 **HUMAN STRUCTURE, FUNCTION, AND DISEASE**

COURSE DESCRIPTION: Health Science Human Structure, Function, and Disease acquaints students with basic anatomy and physiology of the human body. Students learn how the human body is structured and the function of each of the 12 body systems. Students will study the relationship that body systems have with disease from the healthcare point of view. This is a very “hands-on” course, and students will learn through projects and activities in the classroom. Skill procedures and foundation standards are reviewed and integrated throughout the program. Job shadowing is encouraged. This course does not count as a lab science.

GENERAL REQUIREMENTS: This course is recommended for students in grades 10 through 12. Required pre-requisites are the successful completion of Health Science 1, or Sports Medicine 1, or Emergency Medical Services 1 (EMS 1) with **a 75% or higher-grade average**. Students must have completed Biology 1 or be concurrently enrolled. Students are recommended to be First Aid and CPR certified before this course.

Students should be familiar with general medical terminology as well as technical skills associated with vital signs. (Skills learned in previous courses). This course may be counted as one of the optional third unit choices in a three unit or four unit completer path.

PRE-REQUISITES: Biology 1 and completion of level one in Health Science 1, Sports Medicine 1 or EMS 1.

CREDIT: CP 1 unit (120 hours) or 2 units (240 hours)

RECOMMENDED MAXIMUM CLASS SIZE 24 students

CONCENTRATOR: Completes HS1 and HS 2.

HEALTH SCIENCE COMPLETERS:

Three Course: HS 1, HS 2, HS Human Structure, Function and Disease (Or the approved substitute course– see Student Reporting Guide and Health Science page on SCDE Website)

Four or more courses: HS 1, HS 2, Plus any other two courses in the Health Science Cluster

INDUSTRY ALIGNED CREDENTIALS: 1. BLS Healthcare Providers CPR/AED 2. OSHA

Healthcare or any others applicable listed in the Student Reporting Guide.

STACKABLE CREDENTIALS: 1. Heartsaver CPR/AED 2. First-Aid or any others applicable as listed in the Student Reporting Guide.

FOUNDATION STANDARD 1: ACADEMIC FOUNDATION

Healthcare professionals will understand human anatomy, physiology, common diseases and disorders, and medical math principles as required for proficiency within their area. They will use this knowledge as needed in their role. The following accountability criteria are considered essential for students in a health science program of study.

1. **Demonstrate** the ability to analyze diagrams, charts, graphs, and tables to interpret healthcare results.
2. **Demonstrate** competency in basic math skills and conversions as they relate to healthcare.
 - a. The Metric System, i.e., centi-, milli-, kilo-, deci-, and micro-
 - b. Mathematical (average, ratios, fractions, percentages, addition, subtraction, multiplication, division).
 - c. Conversions (height, weight/mass, length, volume, temperature, household measurements)
 - d. Perform mathematical applications to determine vital sign applications and basic pharmacology equations.
3. **Demonstrate** use of the 24-hour clock/military time.
4. **Identify** basic levels of organization of the human body, i.e., chemical, cellular, tissue, organs, systems, organism.
5. **Identify and demonstrate** body planes, directional terms, cavities, and quadrants.
 - a. **Body planes** (sagittal, mid-sagittal, coronal/frontal, transverse/horizontal).
 - b. **Directional** terms (superior, inferior, anterior/ventral, posterior/dorsal, medial, lateral, proximal, distal, superficial, and deep).
 - c. **Cavities** (dorsal, cranial, spinal, thoracic, abdominal, and pelvic).
 - d. **Quadrants** (upper right, lower right, upper left, and lower left).
6. **Identify** basic structures and functions of human body systems (skeletal, muscular, integumentary, cardiovascular, lymphatic, respiratory, nervous, special senses, endocrine, digestive, urinary, and reproductive).
 - a. **Skeletal** (bone anatomy with emphasis on long bone, axial and appendicular skeletal bones, functions of bones to include mineral storage and hematopoiesis, ligaments, types and movements of joints)
 - b. **Muscular** (microscopic anatomy of muscle tissue, types of muscle, locations of skeletal muscles, functions of muscles, tendons, directional movements)
 - c. **Integumentary** (layers, structures, functions and components of skin)
 - d. **Cardiovascular** (components of blood, structures and functions of blood components, structures and functions of the cardiovascular system, conduction system of the heart, cardiac cycle to include blood flow)
 - e. **Lymphatic** (structures and functions of lymphatic system, movement of lymph fluid)
 - f. **Respiratory** (structures and functions of respiratory system, physiology of respiration)
 - g. **Nervous** (structures and functions of nervous tissue and system, organization of

- nervous system, emphasis on sensation, movement and processing)
- h. **Special senses** (structures and functions of eye, ear, nose and tongue; identify senses for sight, hearing, smell, taste, touch)
 - i. **Endocrine** (endocrine versus exocrine, structures and functions of endocrine system, hormones, regulation of hormones)
 - j. **Digestive** (structures and functions of gastrointestinal tract with focus on absorption and excretion, chemical and mechanical digestion, structures and functions of accessory organs)
 - k. **Urinary** (structures and functions of urinary system, gross and microscopic anatomy, process of urine formation, urine composition, homeostatic balance)
 - l. **Reproductive** (structures and functions of male and female reproductive systems, formation of gametes, hormone production and effects, menstrual cycle, and conception)
7. **Describe** common diseases and disorders of each body system (such as: cancer, diabetes, dementia, stroke, heart disease, tuberculosis, hepatitis, COPD, kidney disease, arthritis, ulcers, asthma, cataracts, concussions/TBI, cystic fibrosis, melanoma, muscular dystrophy, myocardial infarction, sexually transmitted infection, urinary tract infections).
- a. Etiology
 - b. Pathology
 - c. Diagnosis
 - d. Treatment
 - e. Prevention
8. **Discuss** research related to emerging diseases and disorders (such as: autism, VRSA, PTSD, Listeria, seasonal flu).
9. **Describe** biomedical therapies as they relate to the prevention, pathology, and treatment of disease.
- a. Gene testing
 - b. Gene therapy
 - c. Human proteomics (delete this one)
 - d. Cloning
 - e. Stem cell research

FOUNDATION 2: COMMUNICATIONS

Healthcare professionals will know and demonstrate the various methods of giving and obtaining information. They will communicate effectively, both orally and in writing.

1. **Use** medical terminology and medical math to communicate information, orally and written.
2. **Apply** active speaking and listening skills

FOUNDATION 3: SYSTEMS

Healthcare professionals will understand how their role fits into their department, their organization and the overall healthcare environment. They will review and identify how key systems affect services they perform and the quality of care. (This foundation is covered in detail in HS 1 and HS 2.)

FOUNDATION 4: EMPLOYABILITY SKILLS

Healthcare professionals will understand how employability skills enhance their employment opportunities and job satisfaction. They will demonstrate key employability skills and will maintain and upgrade skills, as needed.

1. **Demonstrate** employability skills (as they apply to hygiene, dress, language, confidentiality, behavior and work ethic)
2. **Expand** components of a personal **portfolio** (letter of introduction, resume, healthcare project, writing sample, work-based learning, oral presentation, service learning, credentials, technology, and leadership experience).
3. **Participate** in healthcare **work-based learning** experiences (guest speakers, virtual tours, job shadowing, blood drives, community service projects, etc.).

FOUNDATION STANDARD 5: LEGAL RESPONSIBILITIES

Healthcare professionals will understand the legal responsibilities, limitations, and implications of their actions within the healthcare delivery setting. They will perform their duties according to regulations, policies, laws, and legislated rights of clients.

1. **Review** procedures for accurate documentation and record keeping.
2. **Review** standards for Health Insurance Portability and Accountability Act (**HIPAA**).

FOUNDATION STANDARD 6: ETHICS

Healthcare professionals will understand accepted ethical practices with respect to cultural, social, and ethnic differences within the healthcare environment. They will perform quality healthcare delivery.

1. **Discuss bioethical issues** related to disease.
2. **Apply ethical behaviors** in healthcare including personal, professional, and organizational ethics.
3. **Apply procedures for reporting** activities and behaviors that affect health, safety, and welfare of others.

FOUNDATION STANDARD 7: SAFETY PRACTICES

Healthcare professionals will understand the existing and potential hazards to clients, co-workers, and self. They will prevent injury or illness through safe work practices and follow health and safety policies and procedures.

1. **Demonstrate** principles of infection control using standard precautions in relation to the disease process and prevention.
2. **Comply** with safety signs, symbols and labels.

FOUNDATION STANDARD 8: TEAMWORK

Healthcare professionals will understand the roles and responsibilities of individual members as part of the healthcare team, including their ability to promote the delivery of quality healthcare. They will interact effectively and sensitively with all members of the healthcare team.

1. **Act** responsibly as a team member.

FOUNDATION STANDARD 9: HEALTH MAINTENANCE PRACTICES

Healthcare professionals will understand the fundamentals of wellness and the prevention of disease processes. They will practice preventive health behaviors among the clients.

1. **Describe** strategies for **prevention of diseases** including health screenings and examinations.
2. **Apply** practices that promote prevention of disease and injury.

FOUNDATION STANDARD 10: TECHNICAL SKILLS

Healthcare professionals will apply technical skills required for all career specialties. They will demonstrate skills and knowledge as appropriate.

1. **Integrate** procedures for **measuring and recording vital signs as you approach the appropriate body system**, (including recognition of normal ranges and understanding what the data means in relation to body systems and disease.)

FOUNDATION STANDARD 11: INFORMATION TECHNOLOGY IN HEALTHCARE

Healthcare professionals will use information technology applications required within all career specialties. They will demonstrate use as appropriate to healthcare application. (This foundation is covered in detail in HS 1 and HS 2.)

Sample Course Outline for HS 3 – Human Structure and Function

This class is best taught by working in teams of 2-4.

1. Instructor/Student expectations - Standards: 2 & 4
2. HOSA/Leadership - Standard: 4
3. School Safety /Infection control - Standard: 7
4. **Job Shadowing** Encourage opportunities in health related fields – Standard: 4
5. **Anatomy & Physiology** - Standards: 1, 2, 3, 5, 6, 8, 9, 10, & 11
6. Basic Organization(1.4)
7. Body Planes/Directions/Cavities (1.5)
8. **Basic Structures** (1.6) (Includes location, function, disease, treatment, skills, and scenarios)
Diseases may be covered as you go through each system. Students can choose a disease and do a multi-media presentation to the class for some if not all systems. Discuss careers associated with each system.
 - Integumentary System
 - Skeletal System
 - Muscular System
 - Nervous System
 - Special Senses
 - Circulatory System (integrate pulse and blood pressure skills and parameters Standard 10.1)
 - Lymphatic System
 - Respiratory System (integrate respiratory skills and parameters Standard 10.1)
 - Digestive System
 - Urinary System
 - Endocrine System
 - Reproductive System
 - Disease and Disorders(1.7)
 - Emerging Diseases(1.8)
 - Biomedical Therapies(1.9)
9. **Medical Math** - Standard: 1.2
10. **Medical Terminology** – Standard 2

All standards, should be integrated into each system, ethics, safety, infection control, teamwork, careers, technical skills, medical math and medical terminology.

Sample “Hands on Activities”

As students are learning each system there should be a hands on activity or health care skill that goes with each system. Below are some examples of how to reinforce their learning of each system.

- **Body Planes/Directions/Cavities** – orange or donut dissection, Simon Says, trace a team member and fill in cavities and label. Discuss any abnormal conditions.
- **Integumentary System** – build a 3D skin model and label the parts – all types of items may be used to simulate the consistency of the integumentary parts. Discuss disease, abnormal conditions, treatment and scenarios.
- **Skeletal System** – Using “Crunch” bars and Marshmallow treats, students can see the difference between compact and spongy bone. Number 10 bones on “Mr. Bones” your classroom skeleton, with numbered answer sheets and have a race to see who can label the bones the fastest with the correct answers. Do 10 bones every day. Discuss disease, abnormal conditions, treatment and scenarios.
- **Muscular System** – Divide into teams and build muscles on top of student volunteer. Using a clay system such as “Hands on Body Systems” build muscles and talk about muscle actions, disease and abnormal conditions. Dissect chicken legs to see muscular layers. Discuss disease, abnormal conditions, treatment and scenarios.
- **Nervous System** – Internet scavenger hunt on the brain and the full nervous system. Dissect an animal brain. Use clay to build a brain and nerves and place them in the correct anatomical position. Discuss disease, abnormal conditions, treatment and scenarios.
- **Special Senses** – Water taste test – do a blind taste testing on different types of water and let them guess which one they think it is. Nestle, Figi, Aqua, etc., Do an eye chart test, dissect sheep eyes, do a blind touch test, or smell test. Discuss disease, abnormal conditions, treatment and scenarios.
- **Circulatory System** – Trace the flow of blood through the heart. Could be on GIANT paper as a walk-through or smaller as a drawing. Use colored markers, crayons or pencils. Label. Use Clay to build a heart and place in the correct anatomical position, dissect a pig heart; label the valves, the atria, the ventricles and the main vessels. Discuss disease, abnormal conditions, treatment and scenarios.
- **Lymphatic System** – May use clay to build and place lymph nodes and vessels in the correct anatomical positions. Discuss disease, abnormal conditions, treatment and scenarios.
- **Respiratory System** – Build life size or larger than life clay lungs, with the bronchi, bronchioles, and alveoli included. Build small clay lungs and place in correct anatomical positions on clay building boards or small skeletal manikins. Discuss disease, abnormal conditions, treatment and scenarios.
- **Digestive System** – Trace the path of food from the beginning through to the end of the Alimentary Canal. Describe what is happening along the way. Build the system with clay and place it in the correct anatomical position. Label the parts. Discuss disease, abnormal conditions, treatment and scenarios.
- **Urinary System** – Test simulated urine, build the urinary system with clay and place it in the correct anatomical positions on the anatomy body building boards or mannequins. Discuss disease, abnormal conditions, treatment and scenarios.

- ***Endocrine System*** - Build with clay and place in correct anatomical positions on boards or manikin. Assign a disease from this system to the students to present in a media fashion as these are very interesting. Discuss disease, abnormal conditions, treatment and scenarios.
- ***Reproductive System*** – Trace the path of the sperm from production to where they are expelled. Discuss the action of the endometrium. Discuss disease, abnormal conditions, treatment and scenarios.

RESOURCES:

[SCDE State-adopted instructional materials/resources](#)

Thibodeau, Gary A., and Kevin T. Patton, Structure & Function of the Body. Student Edition, Elsevier, Inc. Mosby and WB Saunders, latest edition.

Scott, Ann Senisi and Fong, Elizabeth. Body Structures and Functions Clifton Park, New York: Delmar, Cengage Learning. Latest Edition Simmers, Louise. Diversified Health Occupations. Albany, New

York: Delmar, latest edition. -----, -----, --

---: Teacher's Resource Kit, latest edition.

-----, -----, -----: Workbook, latest edition.

"Hands on Body Systems" starlasteachtips.com/bodysystems.html

Starla's Creative Teaching Tips

starlasteachtips.com/

Today's Class

todaysclass.com

WEB SITES:

South Carolina Department of Education

www.ed.sc.gov

Health Science Educator Resources

www.HealthScienceTeacher.com

National HOSA

www.hosa.org

SC HOSA

www.schosa.org

National Consortium for Health Science Education

www.healthscienceconsortium.org

South Carolina Occupational Information System (SCOIS)

www.scois.net

EDUCATIONAL/CLASSROOM RESOURCES:

American Medical Association: Careers in Healthcare

<http://www.ama-assn.org/ama/pub/education-careers/careers-health-care.shtml>

CareerOneStop formerly known as America's Career InfoNet
<https://www.careeronestop.org/Toolkit/ACINet.aspx>

American Heart Association
<http://www.americanheart.org/presenter.jhtml?identifier=1200000>

American Journal of Nursing
<https://www.jstor.org/journal/americanj nursing>

American Red Cross
<http://www.redcross.org/>

Annals of Internal Medicine
<http://www.annals.org/>

Anatomy in Clay
<http://www.anatomyinclay.com/>

Ask Dr. Math
<http://mathforum.org/dr.math/dr-math.html>

Assessment: Motivational Appraisal of Personal Potential
<https://www.assessment.com/>

Aetna: IntelliHealth
<http://custom.aetna.com/Inova/intelihealth.shtml>

Become an RN
<https://www.learnhowtobecome.org/nurse/registered-nurse/>

Be Something Amazing – Video of Virtual Surgeries and Occupations in Healthcare
<https://besomethingamazing.com/>

Body Works: A toolkit for healthy teens and strong families
<http://www.womenshealth.gov/bodyworks/>

Cancer.Net
<http://www.cancer.net/portal/site/patient>

Cardinal Health: Making healthcare safer and more productive
<http://www.cardinal.com/>

CareerOneStop formerly known as America's Career InfoNet
<https://www.careeronestop.org/Toolkit/ACINet.aspx>

Career Voyages

<https://webarchive.library.unt.edu/eot2008/20080916003633/http://careervoyages.gov/>

CNN Health

<http://www.cnn.com/HEALTH/>

CollegeNet

<http://www.collegenet.com/elect/app/app>

CreativEd Services

<http://www.creativeservices.com/>

Dr. Greene.....Caring for the Next Generation

<http://www.drgreene.com/>

Estronaut: A Forum for Women's Health

<http://www.womenshealth.org/>

Explore Health Careers

<http://explorehealthcareers.org/en/home>

Health Central

<http://www.healthcentral.com/>

Health World Online

<http://www.healthy.net/>

JAMA: The Journal of the American Medical Association

<http://jama.ama-assn.org/>

Learn and Serve America's Service Learning Clearinghouse

<http://www.servicelearning.org/>

Medline Plus: Medical Encyclopedia

<http://www.nlm.nih.gov/medlineplus/encyclopedia.html>

Medical Math Lesson Plans

<http://www.nrccte.org/resources/lesson-plans/health-science/health-science-back-basics>

Medical Mysteries on the Web

<http://webadventures.rice.edu/stu/Games/MedMyst/>

Medical Reserve Corps

<https://mrc.hhs.gov/HomePage>

MedicineNet: We Bring Doctors' Knowledge to You (Medical Dictionary)
<http://www.medterms.com/script/main/hp.asp>

MedlinePlus: Trusted Health Information for You
<http://medlineplus.gov/>

Medscape from WebMD
<http://www.medscape.com/>

Merck: A Global Research-Driven Pharmaceutical Company
<http://www.merck.com/index.html>

Transcription 411: The Online Resource Center for Medical Transcription Students and Professionals
<http://transcription411.com/>

National Institutes of Health, Office of Science Education
<https://www.nih.gov/research-training/science-education>

New England Journal of Medicine
<http://content.nejm.org/>

NORD: National Organization for Rare Disorders
<http://www.rarediseases.org/>

North Carolina Association for Biomedical Research
<http://www.ncabr.org/>

Nurse Spectrum | NurseWeek
<http://www.nurse.com/>

OncoLink: Abramson Cancer Center of the University of Pennsylvania
<https://www.pennmedicine.org/cancer/navigating-cancer-care/getting-started/patient-education/oncolink-cancer-education>

Physicians' Desk Reference
<http://www.pdr.net/browse-by-drug-name>

PubMed: A service of the US National Library of Medicine and the National Institutes of Health
<http://www.ncbi.nlm.nih.gov/PubMed>

Reuters Health: The premier supplier of health and medical news
<http://www.reuters.com/news/health>

RxList: The Internet Drug Index
<http://www.rxlist.com/script/main/hp.asp>

Starla's Creative Teaching Tips
<http://www.starlasteachtips.com/>

States' Career Clusters
www.careerclusters.org

Stay Healthy
<https://www.stayhealthy.com/>

Texas Health Science
<http://www.texashste.com/>

The Educator's Reference Desk
<http://www.eduref.net/>

The Riley Guide: Employment Opportunities and Job Resources on the Internet
<https://www.myperfectresume.com/>

U.S. Public Health Service
<http://www.usphs.gov/>

Us TOO International Prostate Cancer Education and Support Network
<http://www.ustoo.com/>

Web MD
<http://www.webmd.com/>

Weil (Andrew Weil, MD) Your Trusted Health Advisor
<http://www.drweil.com/>

Weil (Andrew Weil, MD) Your Trusted Health Advisor <http://www.drweil.com/>

Yahoo Health
<https://www.yahoo.com/beauty/tagged/health/>