Las Positas College
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Course Outline for SURG 50

BASIC/BIOMEDICAL SCI-SURG TECH

Effective: Fall 2008

I. CATALOG DESCRIPTION:
SURG 50 — BASIC/BIOMEDICAL SCI-SURG TECH — 7.00 units

The basic science part of this course reviews human anatomy as it relates to surgical procedures and is followed by an introduction to physiology and common disease states requiring surgical intervention. Further covered are the basic principles of medical microbiology with emphasis on infection control in the operating room. The biomedical science part of the course includes an introduction to conceptual physics, electricity and robotics to provide an understanding of the workings of surgical technology. The class is designed to prepare students for later clinical experience.

4.00 Units Lecture 3.00 Units Lab

Prerequisite
BIO 7A - Human Anatomy
with a minimum grade of C
and

MATH 110 - Elementary Algebra
with a minimum grade of C
and

HSCI 52 - BASIC MEDICAL TERMINIOLOGY

Strongly Recommended
ENG 1A - Critical Reading and Composition

Grading Methods:
Letter Grade

Discipline:

	MIN
Lecture Hours:	72.00
Lab Hours:	162.00
Total Hours:	234.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. BIO7A
B. MATH110
C. HSCI52
1. combine prefixes, word roots, and suffixes to create medical terms related to surgery;
2. use anatomical, diagnostic, surgical and additional terms as they relate to each body system;
3. construct and combine compound words.
4. pronounce medical terms;
5. write medical terms using correct spelling;
6. use standard medical abbreviations appropriately;
7. demonstrate ability to use a medical dictionary efficiently.

Before entering this course, it is strongly recommended that the student should be able to:

A. ENG1A

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Explain the different organizational levels of the human body (including cells, tissues, membranes, cavities and regions, organs and

systems);
B. Discuss human growth and development;
C. Describe the layers and the functions of the skin and its accessory structures;
D. Outline wound healing;
E. Review bone and cartilage formation and function;
F. List types of joints and their functions;
G. Compare the different types of muscles and describe their functions and actions;
H. List the major structural and functional divisions of the nervous system;
I. Distinguish between the different types of general and special senses;
J. Summarize the mechanisms and functions of nociceptors, proprioceptors, and touch receptors, as well as vision, hearing, equilibrium, olfaction and gustation;
K. Assess the function of the different blood components;
L. Explain blood typing;
M. Describe the clotting mechanism;
N. Summarize heart function, including a description of the cardiac cycle and the cardiac conduction system;
O. Distinguish between fetal and adult circulation patterns;
P. List and explain factors that affect the circulation;
Q. Appraise the three basic different functions of the lymphatic system;
R. Describe the mechanistic function of inspiration and expiration, and internal and external respiration;
S. Identify the functions of the different parts of the digestive system and its accessory structures, starting with the oral cavity and following it through to the rectum and anus;
T. Compare and contrast mechanical and chemical digestion;
U. Evaluate and illustrate the specific functions of pancreas, liver, and gallbladder;
V. Describe the functional unit of the kidneys;
W. List functions of ureters, bladder and urethra;
X. Describe urine composition;
Y. Compare and contrast the functions of the different parts of the male and female reproductive system, including ovaries, fallopian tubes, uterus, cervic, breast, testes, epididymis, accessory glands, penis;
A@. Outline oogenesis and spermatogenesis;
AA. Distinguish between ovarian and uterine cycles;
AB. Describe the functions of the endocrine glands, such as pituitary, thyroid, parathyroid, adrenal, pancreas, gonads, thymus;
AC. Given an organ system, describe three pathologies for which surgery is performed;
AD. Describe developmental defects of each organ system;
AE. Summarize cancers of each organ system;
AF. List degenerative diseases of each organ system;
AG. Explain fluid and hemodynamic disorders;
AH. Illustrate traumas of each organ system;
AI. Identify infectious diseases of each organ system;
AJ. List three microbes and the roles they play in normal human function and in disease;
AK. Relate mechanisms of infection with aseptic practices;
AL. Describe microbiology and its surgical applications;
AM. Review the development of modern microbiology and the historical theories;
AN. Describe microbial cell structure and function;
AO. Compare and contrast the different types of microbial agents and their characteristics;
AP. Explain the process of infection and human and microbial defense mechanisms;
AQ. Explain the principles of sanitation, disinfection, sterilization, and aseptic technique;
AR. Apply some of the fundamental principles of physics to the operating room;
AS. Review the basic concepts of mechanics as it relates to the human body and to surgical equipment;
AT. Examine the physics of light as it relates to vision and fiber optics and lasers;
AU. Explain the physics of sound as it relates to hearing and ultrasonic equipment;
AV. Explain chemistry, such as matter and thermodynamics, as it relates to the human body as well as steam sterilization, and warming/cooling devices;
AW. Define electricity and identify the terms related to electricity and electrical flow;
AX. Identify the basic principle of electrical flow and the types of electrical current;
AY. Define the components of an electrical receptacle;
B@. Review the physics of electricity as it relates to the human body and electrical devices used in surgery, electro-surgery and electrocautery;
BA. Apply electrical knowledge to safe patient care practices in the OR;
BB. Discuss the basic concepts related to robotics;
BC. Describe the concepts of geometry that are used in the design of surgical robots;
BD. Identify the basic components and mechanisms of the robotic system;
BE. List the clinical applications of robotics in the OR;
BF. Apply the principles of robotics to safe patient care practices in the OR;
BG. Read a passage from a medical textbook and interpret its meaning.

V. CONTENT:

A. Anatomy review and overview of Human Physiology pertinent to surgical procedures.
    1. Organization of the Body
    2. Cells
    3. Tissues
    4. Membranes
    5. Cavities and Regions
    6. Organs and Systems
B. Cell Structure and Function
C. Human Growth and Development
D. Wound Healing
E. Systems
    1. Integumetary System
        a. Functions of the Skin
        b. Layers and Functions
        c. Accessory structures
        d. Subcutaneous tissue
    2. Skeletal System
        a. Skeletal Divisions and specific bones
        b. Types of bones
        c. Functions of bones
        d. Bone formation
        e. Cartilage structure and function
        f. Structure of long bones

g. Vertebral column
h. Types of joints and their functions

3. Muscular System
    a. Functions of muscles
    b. Types of muscles
    c. Actions of muscles
    d. Categories of muscles
    e. Terms related to skeletal muscle and related structures
4. Names, locations and actions of the major muscles
    a. Nervous System
    b. Structures and functions of a neuron
    c. Major division of the nervous system
    d. Central Nervous system
    e. Peripheral nervous system
    f. Autonomic nervous system
5. Sensory System
    a. Sense of vision
    b. Auditory sense
    c. Olfaction and Gustation
    d. General senses (nociception, proprioception, temperature, and touch)
6. Circulatory System
    a. Blood
        1. Components and functions
        2. Blood types
        3. Clotting mechanism
    b. Heart
        1. Cardiac cycle
        2. Cardiac conduction system
    c. Blood vessels
        1. Types: location, structure and function
        2. Fetal circulation
        3. Factors that affect circulation
7. Lymphatic System
    a. Types and locations of lymphatic tissues
    b. Lymph composition and circulation
    c. Functions of lymphatic tissues
8. Respiratory System
    a. Different functions of the different parts of the respiratory system
    b. Physiology of Internal and external respiration
    c. Mechanisms of inspiration and expiration
9. Digestive System
    a. Gastro-Intestinal System
        1. Function of the oral cavity, esophagus, stomach, small
        2. Intestine, large intestine
    b. Mechanical and chemical digestion
    c. Liver functions
    d. Functions of the pancreas
    e. Function of the gallbladder
10. Urinary System
    a. Kidney function
        1. Nephron
    b. Renal blood supply and flow
    c. Functions of ureters and male and female urethra
    d. Urine composition and analysis
11. Male and female reproductive systems, function of all the parts
    a. Menstrual, ovarian, and uterine cycles
    b. Pregnancy
12. Endocrine System
    a. Functions of the main endocrine glands
    b. Pituitary gland,
    c. Thyroid gland,
    d. Parathyroid glands,
    e. Adrenal gland,
    f. Pancreas,
    g. Gonads,
    h. Thymus

F. Introduction to Surgical Pathophysiology
1. Developmental defects of each organ system
2. Cancer and cancers of each organ system
3. Degenerative diseases of each organ system
4. Infectious diseases of each organ system
5. Fluid and hemodynamic disorders
6. Trauma of each organ system

G. Microbiology and its Surgical Applications
1. The development of modern microbiology
2. Historical theories
3. Fields of study
4. Microbial cell structure and function
5. Characteristics of microbes
6. Process of infection
7. Human and microbial defense mechanisms
8. Aseptic technique
9. rinciples of sanitation, disinfection, and sterilization

H. Physics
1. Basic concepts of
    a. Mechanics
        1. Relationship to the human body
        2. Relationship to surgical equipment
    b. Light
        1. Relationship to the sight

2. Relationship to fiberoptics and lasers
c. Sound
1. Relationship to hearing
2. Relationship to ultrasonic equipment
d. Matter & Chemistry
1. Relationship to the human body
e. Heat
1. Relationship to human body
2. Relationship to steam sterilization
3. Relationship to warming/ cooling devices
f. Electricity
1. Relationship to human body
2. Relationship to electrical devices
3. Relationship to electro-surgery/ electro-cautery
2. Electricity
a. Definition and terms
1. Circuit
2. Conductor
3. Current
4. Frequency
5. Ground
6. Insulator
7. Isolated circuit
8. Radio frequency
9. Receptacle
10. Resistance
11. Voltage
b. Basic principles of electrical flow
c. Types of current
1. Direct current
2. Alternating current
3. Cycle
4. Frequencies
d. Electrical receptacles
1. Hot wire
2. Neutral wire
3. Ground wire
e. Basic concepts of robotics
1. Terminology
2. Design
3. Robotic components and mechanisms
4. Preparation/positioning of robotic arm(s)
5. Decontamination and sterilization of robotic components
6. Clinical applications
a. Robotics in minimally invasive surgery
b. Robotics in the operating suite
c. Troubleshooting

VI. METHODS OF INSTRUCTION:
A. **Lecture** -
B. **Demonstration** -
C. Skill-building and problem-solving exercises a. Textbook and supplemental reading b. Laboratory exercises c. Journal article review or research d. Written assignments e. Oral presentations
D. **Lab** -
E. **Discussion** -

VII. TYPICAL ASSIGNMENTS:
A. Research paper: “Translate a passage from a medical textbook into layman’s terms” B. Complete weekly readings C. Complete laboratory assignments and laboratory reports

VIII. EVALUATION:
A. **Methods**

1. Exams/Tests
2. Research Projects
3. Papers
4. Oral Presentation
5. Other:
a. Methods
1. Examinations on lecture material
2. Grading of written assignments and research projects
3. Evaluation of oral presentation(s)
4. Comprehensive final examination inclusive of ALL lecture and discussion material

B. **Frequency**

1. Frequency
a. At least 2 midterms
b. At least 4 short written assignments
c. Written research paper
d. At least 1 formal oral presentation
e. Comprehensive final examination

IX. TYPICAL TEXTS:

1. Marieb EN *Essentials of Human Anatomy & Physiology with Essentials of InterActive Physiology CD-ROM.* 8th ed., Benjamin Cummings Publisher, 2006.
2. McKenney Mark G. M.D., and Patrick C. Mangonon M.D. *Understanding Surgical Disease: The Miami Manual of Surgery.* 1st ed., Lippincott Williams & Wilkins, 1998.
3. Scanlon, Valerie C *Understanding Human Structure and Function.* 1st ed., FA Davis Company, 1997.
4. Frey, Kevin B. and Paul Price *Microbiology for Surgical Technologists..* 1st ed., Cengage Delmar Learning, 2003.

5. Any current medical dictionary

X. OTHER MATERIALS REQUIRED OF STUDENTS: