I. OVERVIEW
The following information will appear in the 2010 - 2011 catalog

PHYSO 101 Introductory Human Physiology 5 Units
Prerequisite: Satisfactory completion of BIO 116 or BIO 111 or BIO 101 and ANAT 125 and CHEM 143.

Study of body function, organ system integration, communication, and homeostasis at the biochemical, cellular, and system levels. Includes control of osmolarity, protein synthesis and cellular metabolism; cellular communication; neural information processing; blood movement; fluid balance; respiration and digestion; reproduction; sensory perception and control of movement. Intended for students entering the health professions.

Field trips are not required. (A-F or P/NP - Student choice) Lecture /Lab
Transfer: (CSU, UC) General Education: (MJC-GE: A ) (CSU-GE: B2, B3 ) (IGETC: 5B )

II. LEARNING CONTEXT
Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. COURSE CONTENT

1. Required Content:

   a. Introduction to Physiology
      i. Organization of the body
      ii. Homeostasis

   b. Chemistry of Life
      i. Water and Solutions
      ii. Biomolecules
      iii. Elements and Atoms
      iv. Molecules and Bonds

   c. The Cell
      i. Plasma Membranes
      ii. Organelles
      iii. Cell Junctions
      iv. Membrane Transport
      v. Cell Division
d. Cell Metabolism
   i. Metabolic Reactions
   ii. Energy Changes in Reactions
   iii. Glycolysis
   iv. Krebs citric acid cycle
   v. Oxidative Phosphorylation

e. Membrane Transport
   i. Cellular Membrane
   ii. Passive Transport
   iii. Active Transport
   iv. Epithelial Transport

f. Cellular Communication
   i. Chemical Messengers
   ii. Cellular Receptors
   iii. Signal Transduction

g. Nerve Cells
   i. Neurons and Glial Cells
   ii. Membrane Potential
   iii. Action Potential
   iv. Synaptic Transmission
   v. Neurotransmitters

h. Central Nervous System (CNS)
   i. Anatomy of CNS
   ii. Spinal Cord
   iii. Brain
   iv. Brain Function

i. Sensory Physiology
   i. Receptors and Sensory Pathways
   ii. Somatic Senses
   iii. Chemoreception
iv. Hearing and Equilibrium

v. Vision

j. Autonomic and Motor Nervous System
   Autonomic Nervous System
   i. Somatic Nervous System

k. Endocrine Glands and Hormones
   i. Endocrine communication
   ii. Synthesis of Hormones
   iii. Secretion and Release of Hormones

l. Muscle Physiology
   i. Molecular Mechanism of Contraction
   ii. Mechanics of Muscle Contraction
   iii. Types of Skeletal Muscle Fibers
   iv. Smooth Muscle
   v. Cardiac Muscle

m. Cardiac Physiology
   i. Heart Anatomy
      Electrical Activity of the Heart
   ii. Cardiac Cycle
   iii. Regulation of Cardiac Output

n. Blood
   i. Plasma and Cellular Elements
   ii. Red Blood Cells
   iii. Hemoglobin
   iv. Clotting

o. Blood and Lymphatic Circulation
   i. Vascular System
   ii. Physics of Blood Flow
   iii. Blood Pressure
   iv. Regulation of Circulation
   v. Capillary Exchange
vi. Lymphatic System

p. Respiration
   i. Anatomy of Respiratory System
   ii. Breathing Mechanism
   iii. Respiratory Volumes and Air Flows
   iv. Transport of Gases In the Blood
   v. Regulation of Respiration

q. Digestive System
   i. Functional Anatomy
      Digestion and Absorption
   ii. Gastrointestinal Secretion
   iii. Gastrointestinal; Motility
   iv. Regulation of Gastrointestinal Function

r. Metabolism
   i. Energy Balance
   ii. Regulation of Growth
   iii. Regulation of Metabolism

s. Fluid and electrolyte balance
   i. Anatomy of Urinary System
   ii. Basic Renal Functions
   iii. Regulation of Fluids and Electrolytes
   iv. Regulation of pH
   v. Micturition

t. Reproductive System
   i. Gametogenesis
   ii. Male Reproductive System
   iii. Female Reproductive System
   iv. Fertilization and Pregnancy
   v. Parturition and Lactation

2. **Required Lab Content:**
a. Calculate pH and describe the relation of pH to the conditions of alkalemia and acidemia. (Full description of lab learning goals will following when we do the official review.)

B. ENROLLMENT RESTRICTIONS

1. Prerequisites

Satisfactory completion of BIO 116 or BIO 111 or BIO 101 and ANAT 125 and CHEM 143.

2. Requisite Skills

Before entering the course, the student will be able to:

a. Apply the principles of dimensional analysis to unit conversions
b. Define subatomic particles, cations, anions and isotopes.
c. Identify atomic number and mass of an element on the periodic table.
d. Calculate molar mass
e. Write balanced chemical equations and identify types of equations.
f. Differentiate between ionic, covalent and polar covalent bonds
g. Describe and identify intermolecular bonding
h. Predict the effect of changing pressure, volume, temperature or number of moles on a gaseous system holding one or more of these variables constant.
i. Define vapor pressure, surface tension and boiling point of substances
j. Calculate mass percent, mass/volume percent and volume percent of a solution.
k. Calculate molarity, molality and osmotic pressure and osmolarity of a solution
l. Differentiate between strong and weak acids; strong and weak bases.
m. Calculate pH and hydrogen ion (H+) concentration
n. Identify oxidized and reduced elements in a single replacement reaction
o. Identify families of organic compounds
p. Describe the structure of cells and tissues
q. Compare and contrast the histology and function of the muscle tissues.
r. Identify the external and internal anatomy of the heart
s. Describe the flow of blood through systemic and pulmonary circulations
t. Compare and contrast arteries, arterioles, capillaries, venules and veins
u. Describe the components of the lymphatic system and list their functions.
v. Identify the principal parts of the spinal cord and brain
w. Locate and describe the receptors and structures associated with special senses.
x. Compare and contrast the sympathetic and parasympathetic divisions of the autonomic nervous system.
y. Describe the location, histology, blood and nerve supplies of endocrine glands.

a`. Identify the organs of the respiratory system

aa. Compare and contrast the functional histology of different regions of respiratory system.

ab. Describe the histological structure of the gastrointestinal tract.

ac. Identify the organs of the gastrointestinal tract and explain their functions.

ad. Describe the external and internal gross and microanatomy of the kidney.

ae. Describe the location, structure, histology and function of the sexual organs.

af. Use the language of biology and physiology as it relates to homeostatic mechanisms.

ag. Describe the structure and functions of the plasma membrane

ah. Describe the structure and functions of the membranous and non-membranous cellular organelles.

ai. Explain the role of DNA and gene expression in the control of cellular function.

aj. Explain how DNA and RNA control the production of proteins.

ak. Explain the role of DNA, RNA and proteins in the functioning of a cell, including cellular communication, cellular movement, membrane transport and metabolism.

C. HOURS AND UNITS

<table>
<thead>
<tr>
<th>5 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>INST METHOD</td>
</tr>
<tr>
<td>Lect</td>
</tr>
<tr>
<td>Lab</td>
</tr>
<tr>
<td>Disc</td>
</tr>
</tbody>
</table>

D. METHODS OF INSTRUCTION (TYPICAL)

Instructors of the course might conduct the course using the following method:

1. Material relevant to the objectives will be presented through designated lecture and specific laboratory exercises.

2. Laboratory instruments (including spirometers, electrocardiographs, and computers coupled to data acquisition equipment) are used to investigate physiological principles. Every effort will be made to use human material and examples and to involve the student directly in the investigation.

3. Audiovisual materials will be used to illustrate particular topics

4. Students discuss and answer questions based on written daily objectives.

5. Hypothetical clinical scenarios will be presented to stimulate discussion about application of physiological concepts.

E. ASSIGNMENTS (TYPICAL)

1. EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS

Time spent on coursework in addition to hours of instruction (lecture hours)

a. Students answer short essay questions out of class based on the objectives for the day on a
daily basis.

b. Students will summarize out of class the findings of laboratory investigations in the form of objectives, results, and discussion on a weekly basis.

c. Students will write out of class two or more reviews of contemporary research in physiology per term.

2. **EVIDENCE OF CRITICAL THINKING**
   *Assignments require the appropriate level of critical thinking*

   a. Students will evaluate physiological mechanisms which account for physiological observations. For example: Compare and contrast the role of calcium in the control of cardiac vs. smooth muscle contraction.

   b. Students will apply course principles to hypothetical situations to predict physiological responses. For example: Explain how the body compensates for the loss of blood volume.

   c. Each student will provide a written assessment of completed lab work and explain the results obtained.

F. **TEXTS AND OTHER READINGS (TYPICAL)**

   1. **Book:** Thornton (2004). *The Chemistry of Life* (2nd /e). -.


III. **DESIRED LEARNING**

   A. **COURSE GOAL**
   *As a result of satisfactory completion of this course, the student should be prepared to:*

   explain the chemical and physical processes of the human body at the biochemical, cellular and systemic level as is necessary in the allied health professions.

   B. **STUDENT LEARNING GOALS**
   *Mastery of the following learning goals will enable the student to achieve the overall course goal.*

   1. **Required Learning Goals**
   *Upon satisfactory completion of this course, the student will be able to:*

   a. Apply the concept of homeostasis to physiological processes.

   b. Explain the importance of biomolecules, water and solutions.

   c. Explain membrane structure and relate it to membrane dynamics.

   d. Relate glycolysis, Krebs cycle and oxidative phosphorylation to energy metabolism.

   e. Explain the movement of chemicals across the cell membrane and epithelia.

   f. Compare and contrast different types of receptors and signal transduction mechanisms.

   g. Explain the molecular basis for membrane potential, action potential and synaptic transmission.

   h. Describe and explain the components of the central nervous system.
i. Discuss higher brain functions including memory, learning and motivation.

j. Diagram sensory pathways associated with somatic sensation, olfaction, vision, hearing and equilibrium.

k. Compare and contrast the major divisions of the autonomic nervous system.

l. Describe the sliding filament theory and the events that occur during excitation-contraction coupling.

m. Compare and contrast the physiology of smooth muscle and skeletal muscle.

n. Describe the conduction system of the heart and phases of the cardiac cycle.

o. Classify the constituents of blood and describe the characteristics of each.

p. Contrast and compare the intrinsic and extrinsic pathways for blood clotting.

q. Relate hydrodynamics to blood circulation and the exchange of material between capillaries and tissues.

r. Describe the mechanics of breathing and the transport of gases in the blood.

s. Relate the anatomy of the renal tubule to the key renal functions of filtration, absorption and secretion.

t. Describe the hormonal and neural control of fluid and electrolyte balance and micturition.

u. Describe the absorption of nutrient molecules and patterns of gastric motility.

v. Explain the hormonal and neural regulation of energy balance in the absorptive and post-absorptive states.

w. Describe hormonal control of energy metabolism, growth and hormone secretion.

x. Discuss the neural and hormonal control of male and female sexual cycles.

2. **Lab Learning Goals**
   *Upon satisfactory completion of the lab portion of this course, the student will be able to:*

   a. Calculate pH and describe the relation of pH to the conditions of alkalemia and acidemia. (Full description of lab learning goals will following when we do the official review.)

3. **Recommended Learning Goals**
   *Upon satisfactory completion of the course (when the related recommended content is covered) the student will be able to:*

   a. Explain the role of muscle stretch reflexes in the control of movement.

   b. Explain the role of the cerebral cortex and basal nuclei in the control of movement.

   c. Explain the role of cells and tissues in specific and non-specific immunity.

IV. **METHODS OF ASSESSMENT (TYPICAL)**

   A. **FORMATIVE ASSESSMENT**

   1. The responses by the students to the daily objective questions and to weekly lab write-ups provide for daily and weekly assessment of student progress.
2. Responses by students to daily prompts in class provide additional feedback

B. SUMMATIVE ASSESSMENT

1. The responses by the students to the periodic exams (essays, short answer and multiple choice questions about every three weeks) provides assessment of accumulated student progress

2. The written explanations of contemporary research provide further assessment of accumulated skills and learning

3. The final exam assesses the integration of multiple physiological concepts