



BIOL 505 Advanced Cardiovascular Physiology: Part I - The Heart at Rest and at Work

(2 Credits)

Human Anatomy and Physiology Society Institute (HAPS-I) 2010 Course Syllabus

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Course Designer: Daniel E. Lemons, Ph.D., The City College of New York, CUNY

Text: *Cardiovascular Physiology*, 6th Edition
David E. Mohrman and Lois Jane Heller (Lange Physiology Series – McGraw Hill)

Course Format:

The course is designed for HAPS annual conference attendees. Preparatory work precedes the conference, an all-day workshop at the conference includes hands-on exercises, and final projects are completed after the conference. There is at least 50 hours of course work, including:

1. preliminary directed readings in cardiovascular physiology (20-25 hours).
2. participation in the HAPS-I orientation (Saturday, May 29, 2010, 3-4:30 PM) and two 3-hour workshop sessions (Tuesday, June 1, 2010, 9:30 am - 4:00 pm) during the HAPS Annual meeting in Denver (7 1/2 hours).
3. development of a case study, problem set, laboratory activity, or similar learning tool for use in an undergraduate A&P course (20-25 hours).

Course Description:

BIOL 505 is designed to provide college-level instructors with the opportunity to expand their understanding of cardiovascular function. Following preparatory background work prior to the course meeting in Denver, participants will take part in advanced problem solving workshops that include hands-on exercises within the field of cardiovascular biology. Participants will complete the course with the ability to confidently design and implement learning goals and activities on cardiovascular biology for a college A&P courses taught at a range of levels. BIOL 505 will be conducted in three phases: preliminary directed readings in the assigned text and appropriate journals; participation in specific workshop sessions during the 2010 HAPS Annual

Meeting; and the independent development of a peer-reviewed case study, problem set, or similar learning tool for undergraduates studying cardiovascular biology. Participants will be evaluated on the basis of a variety of criteria (see Evaluation, below), including attendance, participation in problem-solving exercises, and quality of final submitted materials.

Course Learning Outcomes

Upon completion of this course, participants should be able to:

- § Describe the anatomical features of the cardiovascular system, stating the way in which each structure is related to its primary function.
- § Explain the principles of fluid flow and check valves.
- § Predict the CO based on variation of HR, SV, EDV, ESV.
- § Explain the mechanisms by which cardiac output may be increased or decreased.
- § Predict and calculate how stroke volume (SV) would vary following changes in EDV and/or ESV.
- § Describe and explain the mechanisms initiating the normal heart beat.
- § Relate the electrophysiological events of the cardiac cycle to the mechanical events.
- § Describe and explain, from the system to molecular level, the role of hormones, autonomic nerves and intrinsic factors on cardiac output.
- § Apply understanding of normal cardiovascular physiology to predict changes that occur in special circumstances, particularly exercise.
- § Given a pathological state, be able to explain how cardiovascular function would be affected.
- § Design learning tools for undergraduates that facilitate their learning of cardiovascular function.

Evaluation

Participants may earn a total of 100 points in the course, which will be graded on a pass/fail basis, with a "pass" grade requiring 65% of total points. Points will be assigned on the basis of performance in the following course components:

Completion of background assignments	25 points
Readiness Assessment MCQ Test (RAT) before workshop sessions.....	10 points
Attendance and participation in scheduled workshop sessions	25 points
Final Project	40 points
Total	100 points

1. Completion of background assignments: Participants are expected to be reasonably prepared for the problem-solving, hands-on sessions at the meeting, including (at minimum) completion of background reading assignments and workbook pages. The course instructor will be available via e-mail to address questions on background material prior to the conference.
2. Readiness Assessment Test. Participants will complete a 20 question multiple choice question examination on the background material at the beginning of the Tuesday workshop. Use of this test will be related to student assessment strategy and the process of team-based learning.

3. Attendance/Participation: Attendance is required at the HAPS-I orientation and all workshop sessions (6 hours). While in the workshop sessions, participants are expected to engage in all the activities and problem sets, and to contribute during discussions.
4. Final Project: Following the HAPS conference, participants are expected to submit a culminating project that supports the teaching of cardiovascular biology in college-level A&P courses. This project may take the form of a case study, an inquiry-based laboratory activity, a problem set, a visual model, a hands-on model, or another learning tool or activity approved in advance by the instructor. The project must be creatively designed by the participant. Submissions will be peer-reviewed by classmates forming teams. It is expected that these learning tools will be made available to the HAPS membership as a whole for use in their classrooms and laboratories. This may be done through submission of the project to the HAPS pages of the BENPortal to the National Science Digital Library or at the author's discretion, to a journal for a peer-reviewed publication.

Topic Outline of Course:

Dates	Topic	Session	Reading
April 21-23	1. Introduction to course; cardiovascular system overview	pre-meeting	Ch. 1: 1-18
April 24-30	2. The heart as a pump, cardiac output, chambers, valves, one-way flow	pre-meeting	Ch. 3: 47-54; 62-68
April 30 - May 10	3. Cardiac cycle; muscle cells, cardiac action potentials, EC coupling, conduction, automaticity	pre-meeting	Ch. 2:19-46
May 11-12	4. ECG	pre-meeting	Ch. 4:71-77
May 13-20	5. Control of the heart; extrinsic, intrinsic regulation, autonomic NS	pre-meeting	Ch 2:31-33 & 40-42 Ch. 3: 54-62
May 21-26	6. Cardiovascular responses to exercise	pre-meeting	Suppl. reading
June 1 AM	7. Hands-on: the heart as a pump - how and how much*	AM workshop	Suppl. reading
June 1 AM	8. Problem-solving in cardiac electrophysiology*	AM workshop	Suppl. reading
June 1 PM	9. Hands-on: the ECG, the cardiac cycle and the exercise*	PM workshop	Suppl. reading Ch. 4:71-77
June 1 PM	10. Problem-solving in CV function during exercise*	PM workshop	Suppl. reading
June 1 - August 3	11. Final project	post-meeting	Appropriate to topic

*workshop activities will include quantitative problem sets, applied problem-solving using exercise examples, hands-on models, and analysis of data sets

Follow-up Project:

The final project may extend knowledge from any of the above topics, or may focus on other cardiovascular processes not specifically addressed (such as cardiovascular function in extreme environments or cardiovascular pathophysiology). Due date: August 3, 2010.