

PHSL3211

Cardiovascular Physiology and Pathophysiology

COURSE OUTLINE

SEMESTER 1, 2017

Please read this outline in conjunction with the following pages on the [School of Medical Sciences website](#):

- [Advice for Students](#)
- [Learning Resources](#)

(or see "STUDENTS" tab at medicallsciences.med.unsw.edu.au)

COURSE COORDINATORS

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COURSE OUTLINE AND STRUCTURE

The cardiovascular system is vital to normal functioning of the human body. Diseases afflicting the cardiovascular system result in high rates of illness and mortality throughout the world. This course aims to educate the student in important aspects of cardiovascular physiology and pathophysiology, and to present the latest research strategies used to investigate this complex system.

The course is divided into three units, over which the student will be taken from the physiology of cardiac and vascular cells, examine the function and regulation of these cells within vascular tissues and organs, and finally learn about the latest theories and techniques leading research into cardiovascular pathophysiology and disease. As the course progresses, material builds on information presented in earlier classes. Course material is delivered by staff actively engaged in cardiovascular research, able to illustrate theory with examples from their own laboratories.

Unit 1: Cellular Aspects

The aim of this unit is to become familiar with the cellular characteristics of the blood vessels wall. Further emphasis will be placed on interactions that occur between vascular cells and the extracellular environment.

- Endothelial cells
- Cardiac Muscle
- Smooth Muscle: Signal transduction, contractile activity, mechanics.
- Electrophysiology: Ion channels relevant to the cardiovascular system.
- Cellular Junctions: Gap junctions, adherens junctions, integrins

Unit 2: Integration and Control of the Cardiovascular System

This unit aims to expand the knowledge obtained in Unit 1 into circulatory systems and control situations.

- Haemodynamics
- Microcirculation
- Lymphatics: fluid exchange, oedema, cellular basis of lymphatic function
- Control of blood pressure
- Control of cardiac output
- Interaction with Neurohumoral Control: autonomic, hormonal, paracrine
- Control of the Regional Circulations
- Cardiovascular Regulation During Exercise

Unit 3: Molecular Approaches in the Study of the Cardiovascular System

Using modern state-of-the-art experimental approaches this unit aims to use pathophysiological situations to highlight function of the cardiovascular system.

- Circulatory Shock
- Cardiac Arrhythmia and Heart Failure
- Atherosclerosis – alterations in lipid handling leading to disturbed endothelial function and vasoreactivity.
- Reactive Oxygen Species / Ischemia Reperfusion / Adhesion
- Hypertension – use of animal models, including transgenic animals, for the study of disturbances in blood pressure control.

ASSESSMENT AND TEACHING ACTIVITIES

Final Examination	50%	In order to achieve a satisfactory performance in this course it is anticipated that students will achieve a pass mark, or higher, in each assessment task.
Mid-session Test	20%	
Practical	10%	
Poster Presentation	10%	
PBLs	10%	
Total	100%	

Final Examination

The final examination will be composed of multiple-choice and short answer questions covering the entire course. Post or supplementary exams will be made available only in exceptional circumstances.

Mid-Session Test

The mid-session test on April 12th will be a brief test on the material covered to that point of the course only (not including practical material), consisting of multiple-choice and short-answer questions.

Poster Presentation

Work will be undertaken in groups of 3-4, to which students will be assigned. Each group will have a topic area assigned to them, and a published paper to report upon. The final product will be a Poster and should include: an Introduction; Methods; Data drawn from the article; Summary.

This poster must be completed for display in room WW116 by 9AM on Friday 2nd June 2016.

Each group is expected to provide a brief (5 mins) oral presentation of poster.

Possible Topics:

1. Endothelium-mediated vasodilatation.
2. Conducted responses in the vasculature.
3. Ca²⁺-dependency of smooth muscle contraction.
4. Ion channels in regulation of vascular tone.
5. Ion channels in regulation of cardiac function.
6. Mechanotransduction in vascular / cardiac cells.
7. Regulation of lymphatic (vaso) motion.
8. Exercise and cardiovascular remodelling.
9. Impact of altitude on cardiovascular physiology.
10. Transgenic models in the study of the cardiovascular system.
11. Cellular mechanisms underlying hypertension.
12. Cellular mechanisms underlying atherosclerosis.
13. Circulatory shock
14. Mechanisms underlying cardiac arrhythmia / heart failure.
15. Vascular remodelling.

Students may select a topic from the above list, plus a journal article upon which to base their final presentation. Students may use the literature to find extra journal articles to complement their poster presentation. Students may consult with Dr. Murphy or other staff members regarding their assigned topic prior to completing the poster project. Assessment will be based on both the poster presentation and its oral defence.

Practical Classes and Test

There are four 'wet' practical classes; Cardiac Muscle; Recording and Interpretation of the ECG; Exercise Physiology and the Autonomic Nervous System. Students will be examined on the findings of these practicals and the concepts explored in a 1-hour on-line exam during Week 11 (May 15th-19th), which will consist of multiple-choice and short-answer questions.

Problem-Based Learning (PBL) Session

Students will undertake self-directed learning using case studies or scenarios relevant to cardiovascular physiology. In an introductory session students will be given an outline of the problem and "clues" towards what information is required. Students will then research the material and present their findings at a subsequent session. Facilitators will be available to provide direction.

Tutorials

Each unit is followed by a tutorial, with practice multi-choice and short-answer questions on-line. These questions do not constitute a 'bank' of questions and will not appear on any exam. In addition, students are encouraged to collect and submit any questions relating to lecture material, either directly via e-mail or through the discussion boards on Moodle.

TIMETABLE 2017

	Wk	Date	Time	Activity (Lecture, Practical, Problem Based Learning)	Teacher	
Unit One	2	Wed 8 th Mar Fri 10 th Mar	2-4 9-12 1-4	L - Course Introduction / Cardiac Muscle P - Cardiac Muscle (A) P - Cardiac Muscle (B)	Mat D WW116 WW116	TM / MaP TM, SW, NA TM, SW, NA
	3	Mon 13 th Mar Wed 15 th Mar Fri 17 th Mar	5-6 2-4 9-11 1-3	L - Vascular Smooth Muscle: Electrophysiology L - Vascular Endothelium PBL-1.1 'Joan Murray' A: Mat 230; B: Mat 231; C: Mat 232 PBL-1.1 'Joan Murray' D: Mat230, E: Mat231, F: JGoodsLG19	Mat D Mat D	TM TM TM, FB,WH FB,WH
	4	Mon 20 th Mar Wed 22 nd Mar Fri 24 th Mar	5-6 2-4 9-12 1-4	L - Gap Junctions in the Cardiovascular System L - Vascular Smooth Muscle: Mechanics P - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises P - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises	Mat D Mat D WW116 WW116	SS TM TM, SW, AK TM, SW, AK
	5	Mon 27 th Mar Wed 29 th Mar Fri 31 st Mar	5-6 2-4 9-11 1-3	Tutorial Unit One L - Control of Cardiac Output PBL-1.2 'Joan Murray' A: Mat230, B: Mat231, C: Mat232 PBL-1.2 'Joan Murray' D: Mat230, E: Mat231, F: JGoodsLG19	Mat D Mat D	TM / on-line FB TM, FB, WH FB, WH
Unit Two	6	Mon 3 rd Apr Weds 5 th Apr Fri 7 th Apr	5-6 2-4 9-12 1-4	L - Introduction to the ECG L - Haemodynamics P - Recording and Interpretation of the ECG (A) P - Recording and Interpretation of the ECG (B)	Mat D Mat D WW116 WW116	KG MiP KG, TM, FB KG, TM, FB
	7	Mon 10 th Apr Wed 12 th Apr	5-6 2-3	L - Microcirculation & Lymphatics Mid-Session Exam	Mat D Mat D	TM TM, SW
	14th - 23rd Apr - MID SESSION RECESS - MID SESSION RECESS - MID SESSION RECESS					
	8	Mon 24 th Apr Wed 26 th Apr Fri 28 th Apr	5-6 2-4 9-12 1-4	L - Cardiovascular Regulation During Exercise L - Control of Blood Pressure P - Exercise Physiology (A) P - Exercise Physiology (B)	Mat D Mat D WW116 WW116	SB TM SB, staff SB, staff
	9	Mon 1 st May Weds 3 rd May Fri 5 th May	5-6 2-4 9-12 1-4	L - Autonomic Control of the Cardiovascular System L - Control of the Regional Circulations P - Autonomic Control of the CVS P - Autonomic Control of the CVS	Mat D Mat D WW116 WW116	LL TM TM, SW, AK TM, SW, AK
Unit Three	10	Mon 8 th May Wed 10 th May Fri 12 th May	5-6 2-4 9-11 1-3	Tutorial Unit 2 L - Hypertension PBL-2.1 'Michael Koval' A: Mat 230, B: Mat231, C: Mat232 PBL-2.1 'Michael Koval' D: Mat230, E: Mat231, F: JGoodsLG19	Mat D Mat D	TM MM TM, FB,WH TM, FB,WH
	11	Mon 15 th May Wed 17 th May Fri 19 th May	5-6 2-4	PRAC EXAM OPEN L - Cardiac Arrhythmia L - Atherosclerosis PRAC EXAM CLOSED	On line Mat D Mat D On line	JV BC
	12	Wed 24 th May Fri 26 th Jun	2-3 3-4 9-11 1-3	L - Oxygen Radicals and Reperfusion Injury L - Circulatory Shock PBL-2.2 'Michael Koval' A: Mat 230, B: Mat231, C: Mat232 PBL-2.2 'Michael Koval' D: Mat230, E: Mat231, F: Mat232	Mat D Mat D	NJ TM TM, FB, WH TM, FB, WH
	13	Wed 31 st May Fri 2 nd Jun	2-3 3-4 9-12	L - Heart Failure Tutorial Unit 3 Poster Presentations	Mat D Mat D WW116	TC TM / on-line Staff

LECTURERS AND TEACHING STAFF

AK	Mr Ashor Koshaba
BC	Dr Blake Cochran
FB	Dr Fiona Britton
HN	Mr Hong Nguyen
JV	Prof Jamie Vandenberg
KG	Dr Karen Gibson
LL	A/Prof Lu Liu
MM	Prof. Margaret Morris
MaP	Dr Matt Perry
MiP	A/Prof Michael Perry
NA	Ms Nadia Amorim
NJ	Dr Nicole Jones
SB	A/Prof Steve Boutcher
SS	Dr Shaun Sandow
SW	Dr Sarah Wright
TC	Prof Terry Campbell
TM	Dr Tim Murphy
WH	Dr Will Hatton