

PHSL3211

Cardiovascular Physiology and Pathophysiology

COURSE OUTLINE

SEMESTER 1, 2018

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

Dr. Tim Murphy, Room 316 WW West (ph: 9385 3600) tim.murphy@unsw.edu.au

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 1st June 2018.

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 14th-18th), 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 2018

	Wk	Date	Time	Activity (Lecture, Practical, Problem Based Learning)	Teacher	
Unit One	2	Mon 5 th Mar	12-2	L - Course Introduction / Cardiac Muscle	LG03	TM / MaP
		Thu 8 th Mar	12-1	L - Vascular Smooth Muscle: Electrophysiology	LG03	TM
		Fri 9 th Mar	9-12	P - Cardiac Muscle (A)	WW116	TM, ML, NA
			1-4	P - Cardiac Muscle (B)	WW116	TM, ML, NA
3	Mon 12 th Mar Thu 15 th Mar Fri 16 th Mar	12-2	L - Vascular Endothelium	LG03	SS	
		12-1	L - Gap Junctions in the Cardiovascular System	LG03	SS	
		9-11	PBL-1.1 'Joan Murray' A: Mat 101; B: Mat 102; C: Mat 105		TM, ML	
			PBL-1.1 'Joan Murray' D: Mat101, E: Mat102, F: MAT105		TM, ML	
4	Mon 19 th Mar Thu 22 nd Mar Fri 23 rd Mar	12-2	L - Vascular Smooth Muscle: Mechanics	LG03	TM	
		12-1	L - Introduction to the ECG	LG03	KG	
		9-12	P - Recording and Interpretation of the ECG (A)	WW116	KG, ML	
		1-4	P - Recording and Interpretation of the ECG (B)	WW116	KG, ML	
Unit Two	5	Mon 26 th Mar	12-2	L - Control of Cardiac Output	LG03	TM
		Thu 29 th Mar	12-1	Tutorial Unit One	LG03	TM / on-line
	30 th Mar - 8 th Apr - MID SESSION RECESS - MID SESSION RECESS - MID SESSION RECESS					
	6	Mon 9 th Apr Thu 12 th Apr Fri 13 th Apr	12-2	L - Haemodynamics	LG03	MiP
			12-1	Mid-Session Exam; Prac Grp A LG03; Grp B TBD		TM, ML
			9-11	PBL-1.2 'Joan Murray' A: Mat101, B: Mat102, C: Mat105		TM, ML +1
				PBL-1.2 'Joan Murray' D: Mat101, E: Mat102, F: Mat105		TM, ML +1
	7	Mon 16 th Apr Thu 19 th Apr Fri 20 th Apr	12-2	L - Microcirculation & Lymphatics	LG03	TM
			12-1	L - Autonomic Control of the Cardiovascular System	LG03	LL
			9-12	P - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises	WW116	TM, ML +1
			1-4	P - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises	WW116	TM, ML +1
	8	Mon 23 rd Apr Thu 26 th Apr Fri 27 th Apr	12-2	L - Control of Blood Pressure	LG03	TM
			12-1	L - Cardiovascular Regulation During Exercise	LG03	YB
9-12			P - Exercise Physiology (A)	WW116	YB + staff	
1-4			P - Exercise Physiology (B)	WW116	YB + staff	
9	Mon 30 th Apr Thu 3 rd May Fri 4 th May	12-1	L - Control of the Regional Circulations I	LG03	TM	
		12-1	L - Control of the Regional Circulations II	LG03	TM	
		9-12	P - Autonomic Control of the CVS	WW116	TM, ML, TL	
		1-4	P - Autonomic Control of the CVS	WW116	TM, ML, TL	
Unit Three	10	Mon 7 th May	12-2	L - Hypertension	LG03	MM
		Thu 10 th May	12-1	Tutorial Unit 2	LG03	MM
		Fri 11 th May	9-11	PBL-2.1 'Michael Koval' A: Mat 101, B: Mat102, C: Mat105		TM, ML +1
			1-3	PBL-2.1 'Michael Koval' D: Mat101, E: Mat102, F: Mat105		TM, ML +1
	11	Mon 14 th May Thu 17 th May Fri 18 th May	12-1	PRAC EXAM OPEN	On line	
12-1			L - Oxygen Radicals and Reperfusion Injury	LG03	NJ	
1-2			L - Heart Failure	LG03	S-YO	
12-1			L - Cardiac Arrhythmia	LG03	JV	
				PRAC EXAM CLOSED	On line	
12	Mon 21 st May Thu 24 th May Fri 25 th May	12-2	L - Atherosclerosis	LG03	BC	
		12-1	L - Circulatory Shock	LG03	TM	
		9-11	PBL-2.2 'Michael Koval' A: Mat 101, B: Mat102, C: Mat105	LG03	TM, ML +1	
			PBL-2.2 'Michael Koval' D: Mat101, E: Mat102, F: Mat105		TM, ML +1	
13	Thu 31 st May Fri 1 st Jun	12-1	Tutorial Unit 3	LG03	TM / on-line	
		9-12	Poster Presentations 'A'	WW116	Staff	
		1-4	Posters 'B'	WW116	Staff	

LECTURERS AND TEACHING STAFF

BC	Dr Blake Cochran	MM	Prof. Margaret Morris	SS	Dr Shaun Sandow
JV	Prof Jamie Vandenberg	MaP	Dr Matt Perry	S-YO	Dr Sze-Yuan Ooi
KG	Dr Karen Gibson	MiP	A/Prof Michael Perry	TM	Dr Tim Murphy
LL	A/Prof Lu Liu	NA	Ms Nadia Amorim	YB	A/Prof Yati Boutcher
ML	Dr Martin Le Nebelec	NJ	Dr Nicole Jones		