



Australia's
Global
University

Faculty of Medicine & Health
School of Medical Sciences

PHSL3211

Cardiovascular Physiology and Pathophysiology

COURSE OUTLINE

TERM 2, 2021

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 medalsciences.med.unsw.edu.au)

COURSE COORDINATOR

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	40%
Mid-session Test	30%
Poster Presentation	20%
PBL	10%

Total 100%

Lectures

Face-to-face lectures will not be held in 2021. These will be made available as **pre-recordings accessible through Moodle**. We will have a **live (on-line) catch-up session every week** on Teams (1-2PM Thursdays) where you can participate in some revision exercises and ask questions.

Practical Classes

We ask you **to attend all practical classes** if you feel comfortable doing so. These are held in WW120 either 10-1 or 2-5 Wednesdays, weeks 1-5 and week 8 (6 classes in total). These classes feature:

- Allowances for physical distancing.
- Additional health and safety measures have been introduced to keep students and staff safe.
- Work in teams of 4 students.
- Online practical group available - will be provided with online resources, and access to a synchronous Q&A session for each face-to-face practical class.

The practical classes are Cardiac Muscle; Recording and Interpretation of the ECG; Computer Lab; Microcirculation; Exercise Physiology and the Autonomic Nervous System. Completion of pre- and post-lab modules (where present) is compulsory. Students will be examined on the findings of these practicals and the concepts explored as part of the mid-session and final examinations.

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. Students are split into groups of about 15. **We would like you to attend these classes** on campus if you feel comfortable doing so.

Final Examination

The final examination will be composed of multiple-choice and short answer questions covering the entire course including practical material. Post or supplementary exams will be made available only in exceptional circumstances. The final exam period is 13-26 August. The supplementary exam period is 6-10 September.

Mid-Session Test

The mid-session test on July 1st will be a brief test on the material covered to that point of the course only 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 by 10 AM or 2 PM (group depending) on Wednesday 4th August 2020.

Each group is expected to provide a brief (15 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.

Tutorials / catch-up

Every Thursday (1-2) there will be a live tutorial / catch-up session on Teams, 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 or Teams.

Textbooks.

Herring N. and Paterson DJ. Levick's Introduction to Cardiovascular Physiology 6th Ed., CRC Press, 2018.
Levick, JR. Introduction to Cardiovascular Physiology 5th Ed., CRC Press, 2010. Online through library.
Boron WF and Boulpaep EL. Medical Physiology 3rd Ed., Elsevier, 2017. (2nd Ed, from 2012 available online).
Hall JE. Guyton and Hall Textbook of Medical Physiology, 13th Ed., Elsevier, 2015 (online through library).

Useful Links.

- Key Dates <https://student.unsw.edu.au/dates>
- Transitioning to Online Learning <https://www.covid19studyonline.unsw.edu.au/>
- Guide to Online Study <https://student.unsw.edu.au/online-study>
- UNSW Student Life Hub <https://student.unsw.edu.au/hub#main-content>
- Student Support and Development <https://student.unsw.edu.au/support>
- IT, eLearning and Apps <https://student.unsw.edu.au/elearning>
- Student Support and Success Advisors <https://student.unsw.edu.au/advisors>
- Special consideration <https://student.unsw.edu.au/special-consideration>

TIMETABLE 2021

	Wk	Date / Hrs	Time	Activity (Lecture, Practical, Problem Based Learning)	Teacher
Unit One	1	Mon 31 st May	Online record	L - Course Introduction / Cardiac Muscle (2h)	TM/MaP
		Weds 2 nd Jun	10-1	L - Vascular Smooth Muscle (2h)	TM
			2-5	P - Cardiac Muscle (A)	WW120
			2-5	P - Cardiac Muscle (B)	WW120
		Thurs 3 rd Jun	1-2	Live catch-up	TM, NL
					TM, MaP
Unit One	2	Mon 7 th Jun	Online record	L - Vascular Endothelium/Gap Juncs (2h)	SS
		Weds 9 th Jun	10-1	L - Introduction to the ECG (1h)	KG
			2-5	P - Recording and Interpretation of the ECG (A)	WW120
			2-5	P - Recording and Interpretation of the ECG (B)	WW120
		Thurs 10 th Jun	1-2	Live catch-up.	KG, TM
					KG, TM
Unit Two	3	Mon 14 th Jun	Online record	QUEEN'S BIRTHDAY HOLIDAY	TM
		Weds 16 th Jun	10-1	L - Control of Cardiac Output (2h)	MiP
			2-5	L - Haemodynamics (2h)	TM, NL
			2-5	P - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises	WW120
			2-5	P - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises	WW120
		Thu 17 th Jun	1-2	Live catch-up	TM, NL
					TM
	4	Mon 21 st Jun	Online record	L - Microcirculation and Lymphatics (2h)	TM
		Wed 23 rd Jun	10-1	P - Microcirculation	WW120
			2-5	P - Microcirculation	WW120
		Thu 24 th Jun	1-2	Live catch-up	TM, NL
					TM, NL
5	Mon 28 th Jun		L - Autonomic Control of the Cardiovascular System (1h)	LL	
	Weds 30 Jun	10-1	L - Cardiovascular Regulation During Exercise (1h)	AK	
		2-5	P - Exercise Physiology (A)	WW120	
		2-5	P - Exercise Physiology (B)	WW120	
	Thu 1 st Jul	1-2	Mid-Session Exam	AK, other	
				AK, other	
	Mon 5 th Jul - Fri 9 th July		MID SESSION BREAK - MID SESSION BREAK - MID SESSION BREAK		
	Mon 12 th Jul	Online record	L - Control of Blood Pressure (2h)	TM	
	Wed 14 th Jul	10-12	L - Control of the Regional Circulations (2h)	TM	
		2-4	PBL-1 'Joan Murray' Mat 302, 303, 313	TM, NL,	
		2-4	PBL-1 'Joan Murray' Mat 302, 303, 313	TM, NL	
	Thu 15 th Jul	4-5	Live catch-up	TM	
				TM	
	Mon 19 th Jul	Online record	L - Circulatory Shock (1h)	TM	
	Weds 21 st Jul	10-1	L - Atherosclerosis (2h)	BC	
		2-5	P - Autonomic Control of the CVS	WW120	
		2-5	P - Autonomic Control of the CVS	WW120	
	Thu 22 nd Jul	1-2	Live catch-up	TM, NL	
				TM, NL	
Unit Three	9	Mon 26 th Jul	Online record	L - Heart Failure (1h)	SYO
		Weds 28 th Jul	10-12	L - Cardiac Arrhythmia (1h)	JV
			2-4	PBL-2 'Joan Murray' Mat 302, 303, 313	TM, NL
		2-4	PBL-2 'Joan Murray' Mat 302, 303, 313	TM, NL	
	Thu 29 th Jul	1-2	Live catch-up	TM, NL	
				TM, NL	
Unit Three	10	Mon 2 nd Aug	Online record	L Hypertension (2h)	MM
		Weds 4 th Aug	10-1	L - Oxygen Radicals and Reperfusion Injury (1h)	NJ
			2-4	Poster Presentations 'A'	WW120
		2-4	Poster Presentations 'B'	WW120	
	Thu 5 th Aug	1-2	Live catch-up	Staff	
				Staff	

LECTURERS AND TEACHING STAFF

AK	Dr Anthony Keech	S-YO	Dr Sze-Yuan Ooi
BC	Dr Blake Cochran	TM	Dr Tim Murphy
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		
NJ	Dr Nicole Jones		
SS	Dr Shaun Sandow		