



# BSc (Med)(Hons) Exercise Science

**DIVISION OF PHYSIOLOGICAL SCIENCES  
DEPARTMENT OF HUMAN BIOLOGY  
FACULTY OF HEALTH SCIENCES  
UNIVERSITY OF CAPE TOWN**

## **STUDENT BROCHURE**

### **2023**

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## INTRODUCTION TO THE HONOURS PROGRAMME

Welcome to the BSc (Med)(Hons) Exercise Science course at the University of Cape Town (UCT). We hope that you will enjoy the course and that it will be the basis of a successful and fulfilling career. This brochure describes the history of the various courses offered within our Division and explains how the Exercise Science Honours Course will be structured for 2023.

### ***Background to the Division of Physiological Sciences***

Professor Timothy Noakes began his exercise research in a small basement laboratory within what was formerly the Department of Physiology, with one laboratory assistant and a single bicycle. By 1989, the research had grown to such an extent that the South African Medical Research Council (MRC) and UCT agreed to fund a MRC/UCT Bioenergetics of Exercise Research Unit (BERU). In 1991, Professor Noakes was appointed by UCT to establish an Honours degree in Sports Science for scientists, physical educators, physiotherapists and doctors. The purpose of the course was to satisfy the South African demand for a more scientific approach to the maintenance of good health and success in sport.

In 1991 the original Sports Science Honours course was divided into two streams: Exercise Science and Biokinetics. As the field evolved, specialist Sport and Exercise Medicine and Sports Physiotherapy MPhil courses were developed in 1990 and 1995, respectively, with the aim of providing physicians and physiotherapists with a more evidenced-based approach to their respective fields. In August 1995, the Unit moved into the Sports Science Institute of South Africa (SSISA) in Newlands, and in 2000 changed its name to the UCT/MRC Research Unit for Exercise Science and Sports Medicine (ESSM). Professor Noakes retired at the end of 2014 and the Directorship of the Unit was taken over by Professor Vicki Lambert. During the same time, the Unit became recognised as the Division of Exercise Science and Sports Medicine (ESSM) within the Department of Human Biology, Faculty of Health Sciences. In 2020, the Division merged with the Division of Physiological Sciences to form the Division of Physiological Sciences within the Department of Human Biology, with Professor Alison September as Head of Division and Professor Sharon Prince as Head of the Department. Within the Division, Health through Physical Activity, Lifestyle and Sport Research Unit also formed (HPALS), with Professor Vicki Lambert as Director.

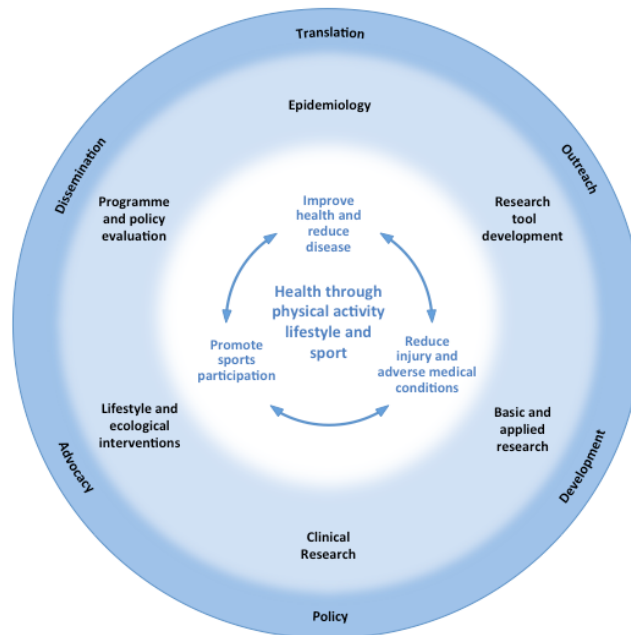
### **HPALS Vision**

*“An active, healthy and winning nation through science”.*

### **HPALS mission statement**

*“A center of excellence for promoting a healthy, active lifestyle and optimal physical performance, through research, innovation, teaching, training, and clinical services”.*





*The research objectives of HPALS are:*

- To conduct research focused on (i) improving health and reducing disease, (ii) reducing injury and adverse medical conditions associated with physical activity and sport, and (iii) promoting sports participation.
- To conduct research of the highest international standard, recognising the interdisciplinary nature of our work as its key strength.
- To recognise the holistic and complex nature of related lifestyle behaviours and co-morbid conditions, high performance, issues of safety and unintended consequences of participation in physical activity and sport.
- To ensure that our programme of research is relevant to all South Africans, addressing issues of social justice and equity, for the development of human capital, communities and the nation.
- To disseminate knowledge through teaching of an international standard, and through translation to the wider community, informing policy and practice.

## **OUTLINE OF THE HONOURS EXERCISE SCIENCE PROGRAMME**

The honours programme consists of the following:

- Fundamentals of exercise physiology module (theory lectures)
- Technique courses covering physiological, biomechanical/movement analyses and biological methodologies (theory and practical)
- An applied exercise physiology module (interactive theory lectures)
- Five thematic seminar series (interactive lectures)
- Research methods and statistics module (interactive lectures)
- A research project (thesis)

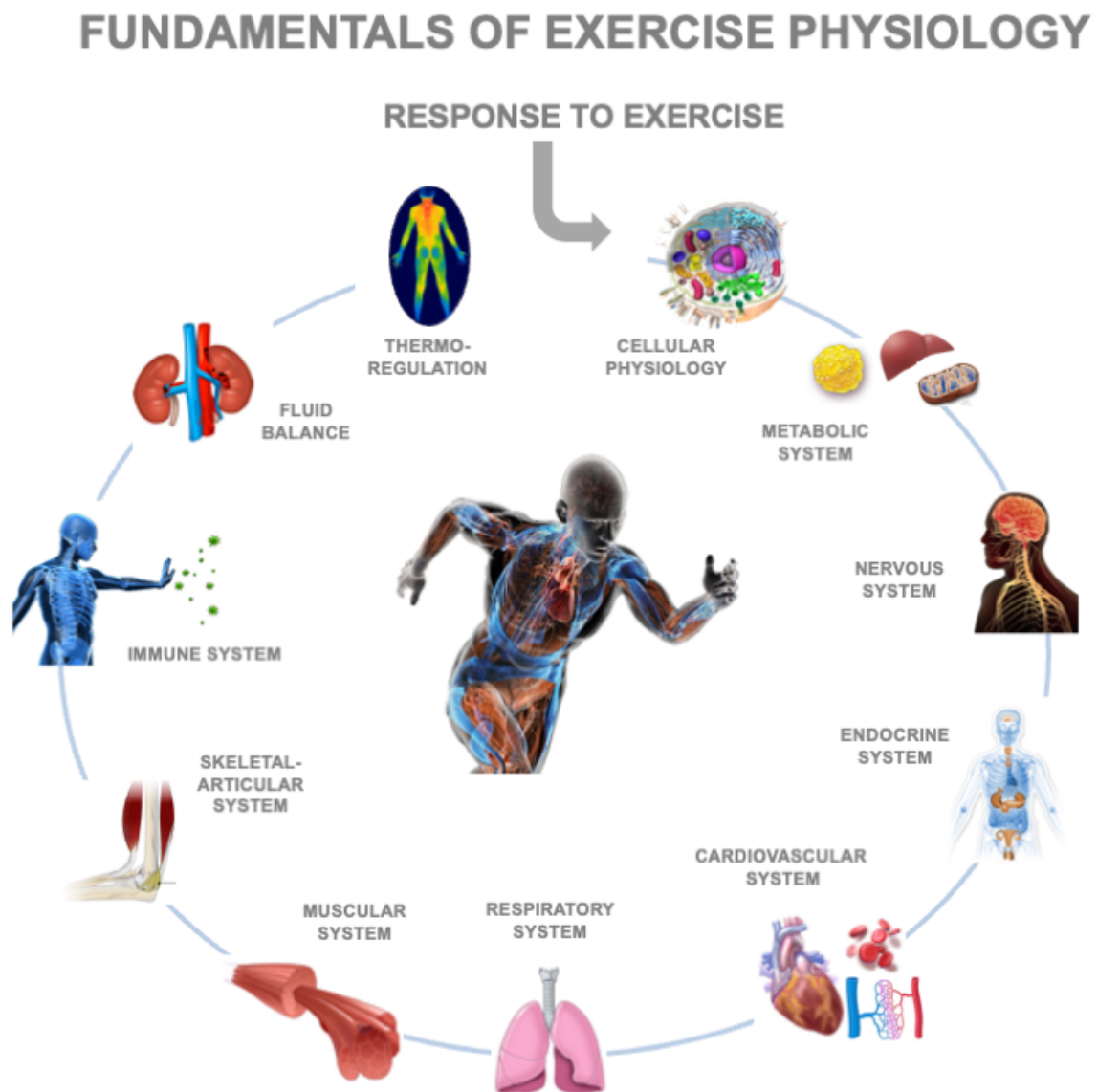
Students are assessed continuously, as well as having to write two examinations and an oral examination.



## Fundamentals of Exercise Physiology Module

Convenor: Dr Dale Rae

This module will run from Monday 6 to Thursday 16 February 2023 in Classroom 1. A tutorial is scheduled for the last 1.5h of each lecture day to help students with any content-related sticking points arising that day. The detailed programme is shown below.



### Objective:

To provide the student with a comprehensive and integrated overview of the bodies' response to exercise, emphasising the acute response to exercise and long-term effects of training on:

- cellular physiology
- the metabolic system
- the nervous system

- the endocrine system
- the cardiovascular system
- the respiratory system
- the muscular system
- the skeletal-articular system
- the immune system
- fluid balance
- thermoregulation

After completion of this module, the student should be able to understand, define and describe:

**1. Cellular physiology** – Prof Alison September (2 lectures)

- Introduction to the cellular level organisation, structure and functions of the various components and organelles.
- The Nucleus
  - transcription
  - translation
- The cell membrane/ plasma membrane and understand its functions
  - mechanisms of transport across the plasma membrane e.g. passive transport, vesicle transport, phagocytosis, facilitated diffusion, osmosis, active transport

**2. The metabolic system** – Prof Malcolm Collins (4 lectures)

- Overview of metabolic pathways
- Anaerobic metabolism:
  - high energy phosphates, glycolysis, glycogenolysis,
- Aerobic/oxidative metabolism
  - mitochondria
  - tricarboxylic acid cycle
  - electron transport chain
  - oxidative phosphorylation
- Basic concepts of nutrition
- Liver gluconeogenesis
- Glucose transport and homeostasis
- Adipose tissue and free fatty acids
- Protein and amino acid metabolism

**3. The nervous system** – A/Prof Yumna Albertus (3 lectures)

- Overview of anatomy and terminology of the central and peripheral nervous systems
- Voluntary generation and control of movement
- The concept of fatigue

**4. The endocrine system** – Prof Vicki Lambert (3 lectures)

- Overview of components of the endocrine system relevant to exercise
- The importance of homeostasis



- Regulation of the storage and mobilisation of metabolic fuels, blood pressure, heart rate, temperature, fluid balance

#### 5. **The cardiovascular system** – A/Prof Jeroen Swart (3 lectures)

- Overview of anatomy and terminology of the heart and blood vessels
- Regulation and control of the cardiovascular system during exercise by means of neurological, hormonal and metabolic inputs
- Heart rate, cardiac output, stroke volume responses
- Limitations to cardiac performance
- Measurement of cardiovascular function during rest and exercise (e.g. ECG, heart rate)

#### 6. **The respiratory system** – A/Prof Jacolene Kroff (2 lectures)

- Overview of anatomy and terminology of the lungs, airways and respiratory muscles
- Mechanics and regulatory mechanisms of breathing during exercise
- Principles of oxygen and carbon dioxide transport from the lungs to other systems (particularly skeletal muscle) and venous return.
- Measurement of respiratory function during rest and exercise (lung function test,  $VO_2$ max test)

#### 7. **The muscular system** – Dr Sharief Hendricks (3 lectures)

- Overview of anatomy and terminology of skeletal muscle, muscle fibres and the contractile apparatus
- Cross-bridge cycle and muscle mechanics
- Metabolism – energy providing pathways (creatine, carbohydrate, fat and amino acids), metabolite transport
- Neuromuscular control of muscle contraction
- Muscle fibre type and its role in strength, power and endurance exercise
- The concept of muscle fatigue
- Damage, repair and regeneration

#### 7. **The skeletal-articular system** – A/Prof Yumna Albertus (2 lectures)

- Overview of anatomy and terminology of bone, ligaments and tendons
- Mechanical role in locomotion
- Repair of bone, ligaments and tendons

#### 9. **The immune system** – A/Prof Jeroen Swart (2 lectures)

- Overview of components of the immune system relevant to exercise
- Effects on immune system components (i.e. leukocytes, lymphocytes, natural killer cell activity, immunoglobulins)
- The inflammatory response - cytokines
- Delayed onset of muscle soreness (DOMS)
- Endocrine regulation of immune function during exercise



10. **Fluid balance** - Dr Dale Rae (2 lectures)

- Regulation of body fluids
- Water balance and fluid shifts
- Exercise-induced dehydration and rehydration
- Exercise-induced hypervolemia

11. **Thermoregulation** - Dr Dale Rae (3 lectures)

- Review of the basics of human thermoregulation
- Thermoregulation during exercise
- Thermoregulatory response to exercise in a hot environment
- Thermoregulatory response to exercise in a cold environment

**Schedule:**

Week 1	Mon 6 Feb	Tue 7 Feb	Wed 8 Feb	Thurs 9 Feb
09h00-10h00	Intro to exercise physiology (DR)	Metabolic system (MC)	Nervous system (YA)	Endocrine system (VL)
10h00-11h00	Cellular physiology (AS)	Metabolic system (MC)	Nervous system (YA)	Cardiovascular system (JS)
11h00-11h30	<b>Break</b>			
11h30-12h30	Cellular physiology (AS)	Metabolic system (MC)	Endocrine system (VL)	Cardiovascular system (JS)
12h30-13h30	Metabolic system (MC)	Nervous system (YA)	Endocrine system (VL)	Cardiovascular system (JS)
13h30-14h30	<b>Lunch</b>			
14h30 -16h00	Tutorial (AS)	Tutorial (MC)	Tutorial (YA, VL)	Tutorial (JS)
Week 2	Mon 13 Feb	Tue 14 Feb	Wed 15 Feb	Thurs 16 Feb
09h00-10h00	Respiratory system (JK)	Muscular system (SH)	Immune system (JS)	Thermoregulation (DR)
10h00-11h00	Respiratory system (JK)	Muscular system (SH)	Immune system (JS)	Thermoregulation (DR)
11h00-11h30	<b>Break</b>			
11h30-12h30	Self-study	Skeletal-articular system (YA)	Fluid balance (DR)	Thermoregulation (DR)
12h30-13h30	Muscular system (SH)	Skeletal-articular system (YA)	Fluid balance (DR)	
13h30-14h30	<b>Lunch</b>			
14h30 -16h00	Tutorial (JK)	Tutorial (SH, YA)	Tutorial (JG, DR)	Tutorial (DR)

**Assessment:** The content for this module will be assessed in a test on the Monday 6<sup>th</sup> March 2023 (09h00 – 12h00).





## ***Movement Analyses/Biomechanics Module***

Convenors:

Dr Sharief Hendricks and Dr Yumna Albertus

Dates: 20 Feb-22 Feb

How do we know if an athletes movement is good or bad?

This three-day module is constructed to provide you with an appropriate understanding behind the movement analyses and biomechanics that underpin human movement, performance and injury – which hopefully equip you to answer the above question.

This course will introduce students to the use of :-

- Video analyses
- Microtechnology
- The vicon system (3-dimensional movement analysis)
- Force platform measurements
- Electromyography

Assessment

The assessment for this course will be in the form of a written report.



## ***Biological Techniques Module***

Convenors: Prof Alison September and Dr Nancy Laguette

Dates: 14 Mar-22 Mar

This course is designed to introduce you to the various techniques and data analyses tools that are available to study the biological composition of various tissues and fluids. The goal is to allow you to gain hands-on practical experience in the lab by using real biological material, but also to emphasise the importance of accuracy in these types of experiments. As you will be working with dangerous and toxic chemicals, this course will also familiarise you with the safe handling, disposal and storage of these types of chemicals. There are four topics to this course, outlined below:

Basic laboratory techniques – Neezaam Kariem & MSc students

- General laboratory safety and introduction to laboratory
- How to keep a proper laboratory book – Neezaam Kariem
- Buffers, pH, molarity and concentrations – calculations and theory
- Liquid handling (including pipettes), pH meters, weighing, centrifuges, distilled water, fume hood – practical

Molecular biochemistry techniques module – Alison September

- Association studies and its application in Sports Medicine
- DNA isolation from blood and quality control
- Principles of polymerase chain reaction (PCR) and optimization (e.g. temperatures, time, MgCl<sub>2</sub> concentrations, etc.)
- Genotyping of DNA – using two PCR based methods (a) restriction fragment length polymorphism analysis (RFLP) and (b) Taqman assays using the realtime PCR machine – principles, practical demonstrations and analysis of data
- Compile a report describing the experimental design, results, discussion and conclusions.

*Assessment:*

The assessment for this course will be in the form of a written report and a laboratory techniques test will be written on **29 March at 9h00-12h00**.



## ***Exercise Physiology Techniques Course***

Convenor:

Dr Dale Rae

Dates: 27 Feb-10 Mar

### **Overview:**

This module will take place from Monday 27 February to Friday 10 March 2023. It comprises some theory, but the main focus is on the practical sessions, which will be run by an expert in the field. Theory sessions will take place in Classroom 1 and practical sessions in the HPALS labs.

### **Objectives:**

- To provide the student with the theoretical knowledge underpinning common physiological tests and techniques used to assess aspects of health, metabolism and exercise performance in humans.
- To train students to set up equipment, collect data and interpret findings in the context of normative values for the general population as well as for athletes.

### **Content:**

- **Exercise testing in healthy adults** (Feroza Lekota)
  - Screening – pre-exercise screening, blood pressure, glucose, cholesterol
  - Health-related physical fitness testing – cardiovascular fitness, muscle strength and endurance, flexibility
  - Skills-related physical fitness testing – speed, power, agility, balance, coordination, reaction time
- **Body composition** (Jacolene Kroff)
  - Height, weight, circumference measures
  - Body fat assessment (BIA, skinfolds)
- **Lung function testing** (Jacolene Kroff)
  - Purpose of pulmonary function tests
  - Forced vital capacity test
- **Cardiac function testing** (Jeroen Swart, Caroline D’Alton, Fallon Hope)
  - Basic principles of the electrocardiogram (ECG)
  - Theory of the ECG stress test
  - ECG stress test (Bios only)
- **Running physiology** (Andrew Bosch)
  - Submaximal testing
  - Running economy and substrate utilisation
  - Maximal testing (e.g. VO<sub>2</sub> max test)
- **Cycling kinematics** (Jeroen Swart)
  - Kinematic tools for cycling
  - Approach to and practical skills of bike set up
- **Metabolic testing** (Dale Rae)
  - Oral glucose tolerance test
- **Physical activity and sleep monitoring** (Vicki Lambert, Dale Rae)
  - Understanding devices used to measure habitual physical activity and sleep
  - Measurement of time spent in habitual physical activity domains using accelerometry



- Assessment of habitual sleep patterns using actigraphy

### Schedule:

Week 1	Mon 27 Feb	Tue 28 Feb	Wed 1 Mar	Thurs 2 Mar	Fri 3 Mar
08h00-09h00	Module introduction (Dale) <i>Classroom 1 (08h30)</i>		Stress ECG theory 1 (Caro) <i>Classroom 1</i>	Stress ECG theory 2 (Caro) <i>Classroom 1</i>	(Research module: 08h30-10h15)
09h00-10h00	Exercise and physical fitness testing theory (Feroza) <i>Classroom 1</i>	Physical activity monitoring theory (Vicki) <i>Classroom 1</i>	Skills-related physical fitness testing prac – group 1 (Feroza) <i>Blue floor, Biokinetics lab</i>	Body composition prac – group 1 (Jaci) <i>Biodex lab</i>	
10h00-11h00		Physical activity monitoring prac – group 1 (Vicki) <i>Classroom 1</i>			
11h00-11h30	<b>Break</b>	<b>Break</b>	<b>Break</b>	<b>Break</b>	Tea and HPALS meeting <i>Classroom 1</i>
11h30-12h30	Health-related physical fitness testing prac – group 1 (Feroza) <i>Blue floor, Biokinetics lab</i>	Physical activity monitoring prac – group 2 (Vicki) <i>Classroom 1</i>	Skills-related physical fitness testing prac – group 2 (Feroza) <i>Blue floor, Biokinetics lab</i>	Body composition prac – group 2 (Jaci) <i>Classroom 1 Biodex lab</i>	(Research module: 11h45-12h45)
12h30-13h30		Sleep monitoring theory (Dale) <i>Classroom 1</i>			<b>Lunch</b>
13h30-14h30	<b>Lunch</b>	<b>Lunch</b>	<b>Lunch</b>	<b>Lunch</b>	Stress ECG prac – group 1 (Bios only) (Fallon) <i>Treadmill lab, Biokinetics lab</i>
14h30-15h30	Health-related physical fitness testing prac – group 2 (Feroza) <i>Blue floor, Biokinetics lab</i>	Sleep monitor set-up prac – group 1 (Dale) <i>Sleep lab</i>	Body composition theory (Jaci) <i>Classroom 1</i>	Basic ECG theory (Jeroen) <i>Classroom 1</i>	
15h30-16h30		Sleep monitor set-up prac – group 2 (Dale) <i>Sleep lab</i>			

Week 2	Mon 6 Feb	Tue 7 Mar	Wed 8 Mar	Thurs 9 Mar	Fri 10 Mar
08h00-09h00	<b>Fundamentals in Exercise Physiology Class Test (09h00 – 12h00) Classroom 1</b>	OGTT prac – group 1 (Dale) <i>Clinical lab and Biodex lab</i>	OGTT prac – group 2 (Dale) <i>Clinical lab and Biodex lab</i>	Sleep data retrieval prac – group 1 (Dale) <i>Sleep lab</i>	(Research module: 08h30-10h15)
09h00-10h00				Cycling kinematics theory (Jeroen) <i>Classroom 1</i>	
10h00-11h00		<b>Break</b>	<b>Break</b>	<b>Break</b>	Tea and HPALS meeting <i>Classroom 1</i>
11h00-11h30		Running physiology theory (Andrew) <i>Classroom 1</i>	Lung function prac (Jaci) <i>Classroom 1</i>	Cycling kinematics prac – group 1 (Jeroen) <i>Bike lab</i>	(Research module: 11h45-12h45)
11h30-12h30					



<b>12h30-13h30</b>	<b>Break</b>	Running physiology theory (Andrew) <i>Classroom 1</i>	Lung function prac (Jaci) <i>Classroom 1</i>		<b>Lunch</b>
<b>13h30-14h30</b>	<b>Lunch</b>	<b>Lunch</b>	<b>Lunch</b>	<b>Lunch</b>	Stress ECG prac – group 1 (Bios only) (Fallon) <i>Treadmill lab, Biokinetics lab</i>
<b>14h30-15h30</b>	OGTT theory (Dale) <i>Classroom 1</i>	Running prac – group 1 (Andrew) <i>Treadmill lab</i>	Running prac – group 2 (Andrew) <i>Treadmill lab</i>	Physical activity data retrieval prac – group 1 (Vicki) <i>Classroom 1</i>	Sleep data retrieval prac – group 2 (Dale) <i>Sleep lab</i>
<b>15h30-16h30</b>	Lung function theory (Jaci) <i>Classroom 1</i>			Physical activity data retrieval prac – group 2 (Vicki) <i>Classroom 1</i>	

**Assessment:** Students will be assessed based on short reports (2-3 pages max) for each practical to be submitted by Friday 24 March 2023



## ***Thematic Seminar Series***

Convenor:

Dr Sharief Hendricks

The thematic modules start on **3 April**. Material in the thematic modules will be presented in varying combinations of lectures, tutorials, self-learning projects, practical exercises, presentations, assignments, and journal paper discussions. The modules are shown below with the module coordinator in brackets. The modules will run concurrently. Each thematic consist of 2 hour sessions over a span of 8 weeks. The topics are described below.

### **Biological basis of physical activity/inactivity and health** (*Prof Vicki Lambert*)

By completing this module, the students will develop a current and comprehensive understanding of the putative mechanisms by which physical activity/inactivity may modify the patho-physiology processes associated with the development of chronic, non-communicable diseases. The students will be able to interpret the scientific literature in order to formulate testable hypotheses concerning the specific mechanisms associated with physical activity and inactivity and conditions such as cardiovascular disease, diabetes, and hypertension. In particular, the focus will be on inter-organ cross-talk, neuro-humoral and biological mechanisms, and dose-response effects.

### **Biology of musculoskeletal soft tissue injuries** (*Prof Alison September*)

By completing this thematic module, the student will understand how science can be applied to understand the pathophysiology of common musculoskeletal soft tissue injuries. Specifically, students will be able to explain the common injuries, the risk factors associated with these injuries and the various models that have been and are being developed to explain the biological mechanism that cause these injuries.

### **Performance and Training** (*Dr Sharief Hendricks*)

By completing this thematic module, the student will understand how science can be applied to improve physical performance, while reducing the risk of injury. Specifically, students will be able to explain the concept of 'sport and exercise science' in managing high performance athletes and working within a high performance environment.

### **Sports nutrition and exercise performance** (*A/Prof Andrew Bosch*)

With the increasing knowledge about the role of nutrition in increasing exercise performance, it has become clear that carbohydrate, amino acids, protein and protein hydrolysate can play an important role. By completing this thematic module, the student will understand how these different nutrients can be used before, during and post-exercise to aid performance and recovery.

### **Circadian rhythms and sleep in sport and health** (*Dr Dale Rae*)

The aim of this module is to provide students with the biological and physiological understanding of the interplay between circadian rhythms, sleep, sport performance and health. Specifically, the students will learn about (i) the importance of maintaining normal rhythms and sleep patterns and (ii)



the effects of disruption of the circadian system or sleep on sports performance, sleep, and the development of diseases such as obesity, diabetes and cancer.

Week 1	3 Apr Mon	4 Apr Tue	5 Apr Wed
09h00-10h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
10h00-11h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
11h00-11h30	Break		
11h30-12h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
12h30-13h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
13h30-14h30	Lunch		
14h30 -16h00			

Week 2	10 Apr Mon	12 Apr Tue	13 Apr Wed
09h00-10h00	Holiday	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
10h00-11h00		Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
11h00-11h30	Break		
11h30-12h30		Performance, Injury Prevention and Training SH	
12h30-13h30		Performance, Injury Prevention and Training SH	
13h30-14h30	Lunch		
14h30 -16h00			



Week 3	17 Apr Mon	18 Apr Tue	19 Apr Wed
09h00-10h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
10h00-11h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
11h00-11h30	Break		
11h30-12h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
12h30-13h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
13h30-14h30	Lunch		
14h30 -16h00			

Week 4	24 Apr Mon	25 Apr Tue	26 Apr Wed
09h00-10h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
10h00-11h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
11h00-11h30	Break		
11h30-12h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
12h30-13h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	





Week 5	1 May Mon	2 May Tue	3 May Wed
09h00-10h00	Public Holiday	Biology of musculoskeletal soft tissue injuries AS and NL	Circadian rhythms and sleep in sport and health DR
10h00-11h00	Public Holiday	Biology of musculoskeletal soft tissue injuries AS and NL	Circadian rhythms and sleep in sport and health DR
11h00-11h30	Break		
11h30-12h30	Public Holiday	Biological basis of physical activity/inactivity and health VL	
12h30-13h30	Public Holiday	Biological basis of physical activity/inactivity and health VL	
13h30-14h30	Lunch		
14h30 -16h00			

Week 7	8 May Mon	9 May Tue	10 May Wed
09h00-10h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
10h00-11h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
11h00-11h30	Break		
11h30-12h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
12h30-13h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
13h30-14h30	Lunch		



<b>Week 8</b>	<b>15 May Mon</b>	<b>16 May Tue</b>	<b>17 May Wed</b>
09h00-10h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
10h00-11h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
11h00-11h30	<b>Break</b>		
11h30-12h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
12h30-13h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
13h30-14h30	<b>Lunch</b>		
14h30 -16h00			

<b>Week 9</b>	<b>22 May Mon</b>	<b>23 May Tue</b>	<b>24 May Wed</b>
09h00-10h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
10h00-11h00	Biology of musculoskeletal soft tissue injuries AS and NL	Sports nutrition and exercise performance AB	Circadian rhythms and sleep in sport and health DR
11h00-11h30	<b>Break</b>		
11h30-12h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
12h30-13h30	Biological basis of physical activity/inactivity and health VL	Performance, Injury Prevention and Training SH	
13h30-14h30	<b>Lunch</b>		
14h30 -16h00			



<b>Week 10</b>	<b>29 May Mon</b>	<b>30 May Tue</b>	<b>31 May Wed</b>
<b>09h00-10h00</b>	<b>Biology of musculoskeletal soft tissue injuries</b> AS and NL	<b>Sports nutrition and exercise performance</b> AB	<b>Circadian rhythms and sleep in sport and health</b> DR
<b>10h00-11h00</b>	<b>Biology of musculoskeletal soft tissue injuries</b> AS and NL	<b>Sports nutrition and exercise performance</b> AB	<b>Circadian rhythms and sleep in sport and health</b> DR
<b>11h00-11h30</b>	<b>Break</b>		
<b>11h30-12h30</b>	<b>Biological basis of physical activity/inactivity and health</b> VL	<b>Performance, Injury Prevention and Training</b> SH	
<b>12h30-13h30</b>	<b>Biological basis of physical activity/inactivity and health</b> VL	<b>Performance, Injury Prevention and Training</b> SH	
<b>13h30-14h30</b>	<b>Lunch</b>		
<b>14h30 -16h00</b>			



## ***Applied Exercise Science Module***

Convenor: Dale Rae

Dates: 3 Apr-1 June

### **The objectives of this module are**

- To build on and integrate the learning which took place in the Fundamentals of Exercise Science module
- To develop an understanding of the applications of Exercise Science

### **Module assessment**

- Students will be assessed through a class test (MCQ format covering all topics presented in the module, 50%), and 2 assignments.

Topics will include:

- Environmental physiology
- Exercise in the heat and cold
- Exercise at high altitude and altitude training
- Diving/ hyperbaric environment: effect on physiological systems
- Adaptations to detraining / bed rest / injury / space flight
- Response to training
- Adaptation to endurance and resistance training
- Periodisation, over-reaching, and overtraining
- Monitoring of high performance athletes
- Exercise and training in children and youth
- Physical activity, gross motor development and sedentary behaviour in children and adolescents
- Maturity assessment in youths
- Talent identification and early specialisation
- Athlete development models for sports participation
- Nutrition in sport
- Insulin resistance and metabolic syndrome in athletes
- Nutrition
- Energy balance: consequences of reduced weight maintenance
- Neurophysiology
- Autonomic nervous system regulation during peak sporting performance
- Motor neurone disease and exercise
- Special topics
- The female athlete triad
- Sports-related concussion
- Genetics and sports performance
- Doping in sport
- Ageing physiology: exercise and performance in older individuals
- Case studies with Andrew Bosch



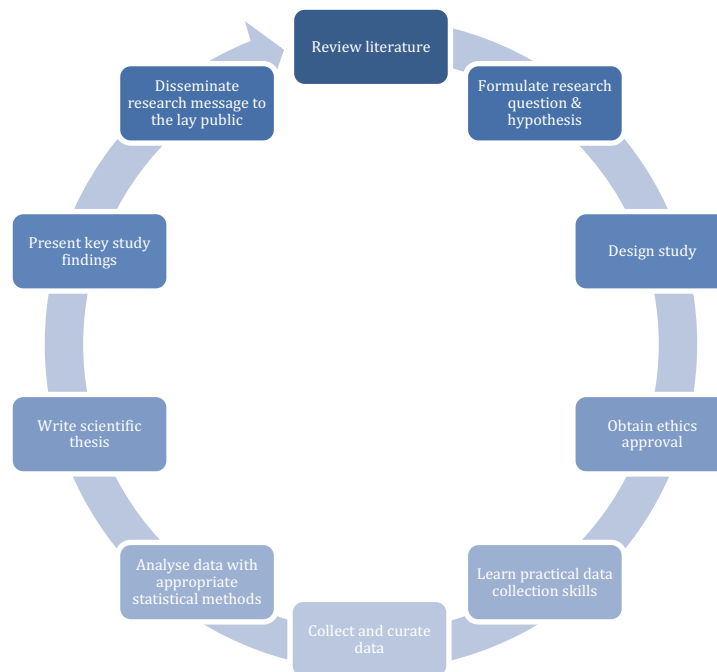
## Research Methods and Statistics Module

**Convenors:** Prof Vicki Lambert and Dr Dale Rae

This module will run from Friday 10 February to Tuesday 2 October 2023. We will typically meet on a Friday in Classroom 1 (09h00-10h15 and 11h45-12h45) for lectures and tutorials. In addition to our weekly Friday sessions, we will have a dedicated Biostats week from 21-25 August. Students are expected to attend the weekly HPALS research meetings (10h30-11h30, SSISA Auditorium). The journal clubs in terms 1 and 2 are compulsory for the Exercise Science students, strongly encouraged for the new MSc/PhD students and optional for the Biokinetics students. The tutorials are also strongly encouraged for all students, but are optional for the Biokinetics students. The detailed schedule for this module is shown below.

### Objective:

- To provide students with the necessary theoretical concepts and practical analytical skills to complete the lifecycle of a research study, beginning with formulating an appropriate research question through to communicating the key findings to a scientific and lay audiences.



### Life cycle of a research study

After completion of this module, students should be able to:

- Develop a testable hypothesis designed to answer a scientific research question
- Critically evaluate scientific publications with regards to study design, statistical approach used, interpretation and strength of findings
- Understand common study designs to test a scientific research question
- Understand the ethical considerations relating to human and animal research
- Think about appropriate questionnaires, tests or tools to collect data

- Demonstrate ability to collect and manage data
- Define, understand and be able to apply key statistical tests using SPSS (or similar software)
- Demonstrate ability to communicate key scientific findings through a written task and oral presentation

Important dates	
<b>Thu 9 Feb</b>	Honours Research Project booklet released
<b>Fri 10, 17 Feb</b>	Staff and student breakfast to discuss Honours Research Projects (09h00-10h00)
<b>Fri 24 Feb</b>	Students to submit Honours Research Project choices (17h00)
<b>Wed 1 Mar</b>	Assignment of Honours Research Projects
<b>Fri 14 Apr</b>	Honours Research Project proposal oral presentations
<b>Fri 5 May</b>	Honours Research project written proposals due (17h00)
<b>Mon 2 Oct</b>	Biostats test
<b>Mon 20 Nov</b>	Honours Research Project thesis due (17h00)
<b>Fri 24 Nov</b>	Honours Research Project final oral presentations

#### Schedule:

Terms 1 and 2			
Date	Time	Topic	Lecturer
3 Mar	09h00-10h15	Introduction to the research process, formulating a research question and testable hypothesis	Dale Rae, Vicki Lambert
	11h45-12h45	Ethical considerations	Dale Rae
10 Mar	09h00-10h15	Critical appraisal of the literature	Dale Rae
	11h45-12h45	Journal club*	Mike Lambert
17 Mar	09h00-10h15	Introduction to searching research literature databases	Gill Morgan
	11h45-12h45	Journal club*	Mike Lambert
24 Mar	09h00-10h15	Study design and developing your research protocol	Dale Rae
	11h45-12h45	Journal club*	Mike Lambert
14 Apr	09h00-13h00	<b>Research project proposal presentations</b>	
21 Apr	09h00-10h15	Introduction to EndNote	Namhla Madini
	11h45-12h45	Journal club*	Mike Lambert
5 May	17h00	<b>Research project written proposals</b>	
12 May	09h00-10h15	Literature reviews: narrative, systematic and meta-analyses	Dale Rae
	11h45-12h45	Journal club*	Mike Lambert
19 May	09h00-10h15	Qualitative research methodology 1	Mary Ann Dove
	11h45-12h45	Journal club*	Mike Lambert
26 May	09h00-10h15	Qualitative research methodology 2	Mary Ann Dove
	11h45-12h45	Journal club*	Mike Lambert

\* Journal club – compulsory for the Exercise Science students, optional for all others (aim is to help students learn to critically appraise scientific research)



Terms 3 and 4			
Date	Time	Topic	Lecturer
21 Jul	09h00-10h15 11h45-12h45	Questionnaire development and measurement scales and scores	Vicki Lambert
28 Jul	09h00-10h15 11h45-12h45	Writing for research Displaying data for research tutorial	Alison September Dale Rae
4 Aug	09h00-10h45 11h45-12h45	Bridging research design to statistical analysis Curating data in spreadsheets tutorial	Vicki Lambert Dale Rae
11 Aug	09h00-10h15 11h45-12h45	Variables, measures of central tendency, variability, descriptive statistics	Dale Rae
21-25 Aug	09h00-16h00	<b>Biostats week</b>	
15 Sep	09h00-10h15 11h45-12h45	Social media and research	Sharief Hendricks
22 Sep	09h00-10h15 11h45-12h45	SPSS tutorials / consolidation	Dale Rae
29 Sep	09h00-10h15 11h45-12h45	SPSS tutorials / consolidation	Dale Rae
2 Oct	09h00-13h00	<b>Biostats test (open book)</b>	

#### Biostats week:

	Mon 21 Aug	Tue 22 Aug	Wed 23 Aug	Thurs 24 Aug	Fri 25 Aug
<b>09h00-10h15</b>	Probability testing, sources of error, t-tests and sample size determination (VL)	SPSS Practical exercises tutorial (VL)	Multiple linear regression analyses (VL)	Non-parametric statistics (DR)	Integrated stats tutorial-bringing it all together (VL, DR)
<b>10h15</b>	<b>Break</b>				
<b>10h45-12h00</b>	One-way analysis of variance and post-hoc (DR)	Introduction to correlation and limits of agreement (ML)	SPSS Practical exercises tutorial (VL)	SPSS Practical exercises (DR)	HPALS meeting
<b>12h00-13h00</b>	<b>Lunch break</b>				
<b>13h00-14h15</b>	SPSS Practical exercises tutorial (DR)	Typical error of measurement, effect size and smallest worthwhile change (ML)	Measures of occurrence and effect, relative risks and odds ratios (VL)	Logistic regression analyses (DR)	13h30: Integrated stats tutorial - bringing it all together (VL, DR)
<b>14h15</b>	<b>Break</b>				
<b>14h45-16h00</b>	Two-way ANOVA, analysis of covariance and repeated measures (VL)	SPSS Practical exercises tutorial (ML)	SPSS Practical exercises tutorial (VL)	SPSS Practical exercises tutorial (DR)	



**Assessment:**

Your overall module mark will count as 5% of your total course mark and is comprised of the following components:

Oral research project proposal presentation	20%
Written research project proposal	30%
Biostats test	50%

**Research Project Proposal Presentations (due: 14 April 2023)**

These are oral presentations in which each student will have 8 minutes to present their Research Proposal, with 5 minutes for questions. Students should make use of presentation software like PowerPoint, KeyNote, Prezi, Canva or similar. The presentation should include sections on: Background, Aim, Methods (Study design, participants, data collection tools and procedures, planned statistical analysis approach), Time frame. Apart from having the opportunity to practice presentation skills, a key outcome of this process is for students to integrate feedback from staff and fellow students on their design to strengthen their written project proposal.

**Research Project Written Proposals (due: 5 May 2023)**

Each student is required to submit a written research project proposal. These are to be sent electronically to Ms Ayesha Hendricks by 17h00 on the due day. Late submissions shall incur a 5% penalty. Proposals may be word or pdf documents and must follow the format required for research proposals submitted to the Faculty of Health Science's Human Research Ethics Committee. Guidelines for submissions are available here and students will be assisted in this process before handing in. There is no word limit / requirement but students are encouraged to be concise. These are the required sections:

- Introduction: Build a clear case for the research project
- Purpose: Clearly articulate the study aims and objectives and hypotheses
- Methods: Study design, overview and setting; participants (including recruitment, inclusion and exclusion criteria; detailed study procedures; data and statistical analyses.
- Ethical considerations: Potential risks and discomforts, potential benefits to participants, informed consent process, privacy and confidentiality, participant reimbursement, emergency care and insurance
- Timeframe
- References
- Appendices





### **Research Project Thesis (due: 20 November 2023)**

Each student will prepare and submit a small written thesis relating to their research project. The format shall be that of a manuscript to be submitted to a scientific journal for publication. Together with the supervising team, the student should select the most appropriate journal for their “thesis manuscript”, and follow the guidelines with regards to structure, word count, style, format for tables and figures, references etc. Additional material such as consent forms, questionnaires or other tools used in data collection may be included as Appendices. The students should also include the Author Instructions for the journal for which their thesis has been prepared. Each thesis needs to contain a Plagiarism declaration. Theses may be submitted as single word or pdf documents, and should be emailed to Ms Ayesha Hendricks by 17h00 on the due date.

### **Research Project Final Oral Presentations (due: 24 November 2023)**

Finally, students will communicate the most important aspects of their Research Projects through an oral presentation delivered to staff, colleagues, parents and peers. Students should prepare a 10 minute scientific presentation which comprises Introduction, Methods, Results and Conclusions sections and be prepared to respond to questions from the audience.

## **DIVISIONAL MEETING**

On Friday mornings, honours students will join staff, MSc and PhD students for tea and cake from 10h00-10h30 and then a divisional meeting for about an hour (10h30 – 11h30). At this meeting, various topics are presented and discussed. The presenter will either be a student, staff member or visiting academic. This is a compulsory meeting for ALL students (Honours, MSc and PhD) and staff. Should you not be able to attend, you are to please tender apologies to the Prof Alison September and the Friday meeting convenor.

### ***Science and Communication Module***

***Convenors: Sharief Hendricks and Nancy Laguette***

This module is part of the BSc Honours Joint Programme. Classes will take place on Med Campus, Thursday afternoons. This module will require the completion of a blog/infographic, a reflective piece and a literature review.



## EXAMINATIONS

Final exams will consist of an oral exam and two 3-hour written papers. Paper 1 will contain questions that are designed to integrate the knowledge of **ALL** the work during the year, and Paper 2 will test the student's ability to critically analyse a scientific paper. Assessment of the work of modules and laboratory techniques, exams and the research project will each constitute 25%, 15%, 25% and 35% of the final year mark, respectively. Details of how these marks are derived are shown below:

### *Contributions to the final marks from the tests, exams and the research project*

<b>Theory Modules</b>	<b>40%</b>
Fundamentals of exercise science	5%
Research methodology	5%
Applied exercise science series	5%
Thematic Module 1	4%
Thematic Module 2	4%
Thematic Module 3	4%
Thematic Module 4	4%
Thematic Module 5	4%
Science and Communication	5%
<b>Laboratory techniques</b>	<b>20%</b>
<b>Final Exams</b>	<b>40%</b>
Oral exam	10%
Paper 1 (compressive theory exam)	20%
Paper 2 (journal paper exam)	10%
<b>Coursework</b>	<b>100%</b>
Written report	90%
Oral presentation	10%
<b>Research</b>	<b>100%</b>



## Criteria to pass the Honours Programme

To pass the course, students must achieve a minimum of 50% for each of the following sections:-

1. Theory Modules
2. Laboratory techniques
3. Final Exams
4. Research

Pass marks of 50-59%, 60-69%, 70-74% or 75% and higher will earn either third (3), lower second (2-), upper second (2+) or first class (1) degrees, respectively.

Students wishing to be considered for further postgraduate study in the department should try to achieve an upper second class or first class BSc(Med)(Hons) degree. Postgraduate students with a first class BSc (Med)(Hons) degree can apply for special scholarships. Information about scholarships is available on the Postgraduate Bursary Office website.

## TEXTBOOKS AND REFERENCE MATERIALS

The recommended text books, although not compulsory, are:

Exercise Physiology. Human Bioenergetics and its Applications, 4<sup>th</sup> edition, G.A. Brooks, T.D. Fahey and K.M. Baldwin, McGraw-Hill Publishing Company, 2005

Physiology of Sport and Exercise. W. Larry Kenney, Jack Wilmore, David Costill, Human Kinetics

The above can be found in the **Resource centre**. This centre is currently situated in the *Timothy Noakes Board room* and we encourage you to make use of this facility.



**Important dates 2023**

<b>Date</b>	<b>Description</b>	<b>Convenor(s)</b>
1 Feb – 3 Feb	Orientation Week	
6 – 16 Feb	Fundamentals	Dale Rae
20 Feb-22 Feb	Movement Analyses/Biomechanics	Sharief Hendricks and Yumna Albertus
23-24 Feb	BLS	
27 Feb-10 Mar	Exercise Physiology Techniques	Dale Rae
3 Mar	Research Module (Every Friday)	Vicki Lambert and Dale Rae
	<b>Fundamentals Test</b>	
13 Mar	Laboratory Health and Safety	Neezaam Kariem
14 Mar-22 Mar	Biological Techniques	Alison September and Nancy Laguette
<b>29 Mar</b>	<b>Biological Techniques Test</b>	
25 Mar-2 Apr	Term 1 Vacation	
3 Apr-1 June	Thematic Seminar Series	Sharief Hendricks
3 Apr-1 June	Applied Exercise Science (Every Thursday)	Dale Rae
<b>8 Jun</b>	<b>Paper 1</b>	
<b>13 June</b>	<b>Applied Exercise Science Test</b>	
<b>14 June</b>	<b>Oral Exam</b>	
16 Jun to 23 Jul	Term 2 Vacation	
24 July	Term 3 Start	
26 July	Literature Review Instructions	
30 August	Literature Review Submission	
TBC	Statistical Analyses Week	
<b>TBC</b>	<b>Research Module Open Book Test</b>	
<b>TBC</b>	<b>Paper 2 (Journal Article)</b>	
<b>20 Nov</b>	<b>Research Project Hand-in</b>	
<b>24 Nov</b>	<b>Research Project Presentation</b>	

