

SPORT SCIENCE & MANAGEMENT
SS3322 ENVIRONMENTAL EXERCISE PHYSIOLOGY

Academic Year	2025-26	Semester	1
Course Coordinator			
Course Code	SS3322		
Course Title	Environmental Exercise Physiology		
Pre-requisites	-		
No of AUs	3		
Contact Hours	39		

Course Aims

This course aims to examine the role and challenges the environment plays in sport. The course is designed to be an upper-level exercise physiology module for undergraduate sport science students. The course will introduce you to the physiological adaptations and challenges faced by athletes/exercising individuals across the entire spectrum of environments, including heat, cold, altitude, pollution, underwater and in response to microgravity and bed rest. In addition, strategies to overcome these challenges will be examined. Laboratories will provide hands-on opportunities to examine some of these challenges, and guest lectures/visits will support the lecture material.

Intended Learning Outcomes (ILO)

By the end of this course, you should be able to:

1. describe and discuss body heat production at rest and during exercise, how the environment affects heat loss - including physiological responses to exercise in the heat - and provide examples and compare strategies to mitigate heat gain during exercise, including discussion of the need for fluid provision during exercise.
2. discuss the role of air pollution on the exercising individual.
3. recognise and illustrate the stresses on the body during diving.
4. articulate how the body changes and adapts to cold environments and altitude.
5. describe changes to the body during conditions of microgravity or bed rest.

Course Content

The following topics will be covered:

1. Thermoregulation
2. Exercise in the heat
3. Fluid provision during exercise

4. Cold exposure
5. Exercise and air pollution
6. Diving physiology
7. Exercise at altitude
8. Effects of microgravity and bed rest on exercise performance

NTU Competencies & Graduate Attributes

NTU Competencies	
Character	
Competence	√
Cognitive agility	√

NTU Graduate Attributes	
Graduate Attributes	Level (i.e., basic, intermediate, advanced)
1. Care for Environment	Basic
2. Collaboration	Advanced
3. Communication	Advanced
4. Sense Making	Intermediate
5. Project Management	Intermediate

Assessment (includes both continuous and summative assessment)

Component	ILO Tested	Weighting	Team/ Individual	Assessment Rubrics
1. Laboratory Report	1	40%	Team/Individual	Appendix 1
2. Final Examination	1-5	60%	Individual	
Total		100%		

Formative Feedback

During lessons, topics will be discussed, and immediate feedback will be provided on thoughts shared. In addition, written feedback will be provided on the laboratory report completed. This will include the strengths as well as areas for improvement. For the written examination, written generic feedback will be posted in NTULearn after the examination for all students, along with the median course grade. You can also seek feedback on your performance from the course instructor as required.

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lectures	Lectures will provide information for key learning concepts and theories and support understanding of key concepts
Laboratories	Laboratories will:

	<ul style="list-style-type: none"> • Give hands-on experiential learning to support key theories and information provided in class. • Provide tasks for you to utilise what you have recently learned to solve specific problems. • Give space and time for small group activities and discussions to allow you to assimilate the content and for sharing learning. • Allow opportunity for verbal feedback from the instructor on techniques and material.
Blended Learning	Time will be given for learning from online materials as a part of the flipped teaching approach. These materials will support key concepts covered in lectures and laboratories.

Reading and References

NIE Research and Publications

1. Choo, H.C., Choo, D.H.W., Tan, I., Chang, J., Chow, K.M., Lee, J.K.W., Burns, S.F., Ihsan, M. Effect of ice slurry ingestion on thermoregulatory responses in humid and dry heat. *European Journal of Applied Physiology*. doi: 10.1007/s00421-023-05235-y.

Other Readings and References

Recommended texts:

2. McArdle, W.D., Katch, F.I., & Katch, V.L. (2022). *Exercise Physiology: Nutrition, Energy, and Human Performance*. 9th Edition. Lippincott Williams & Wilkins. ISBN: 9781975160043.
3. Powers, S.K., Howley, E.T. & Quindry, J. (2021). *Exercise Physiology: Theory and Application to Fitness and Performance*. 11th Edition. McGraw-Hill. ISBN: 9781260570922.

Course Policies and Student Responsibilities

(1) General

You are expected to complete all assigned pre-class readings and activities, attend all classes – lecture and laboratory – punctually, submit all scheduled assignments and take tests by due dates. You are not allowed to swap laboratory groups without express permission from the course coordinator. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for sessions they have missed. You are expected to participate in all discussions and class activities unless there is a valid medical reason not to do so.

(2) Absenteeism

Absence from class without a valid reason will affect your overall course grade. Valid reasons include falling sick, supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.

If you miss a lecture, you must inform the course instructor via email prior to the start of the class.

(3) Absence Due to Medical or Other Reasons

If you are sick and not able to complete a test or submit an assignment, you have to submit the original Medical Certificate (or another relevant document) to the Sport Science & Management (or Home School) administration to obtain official leave. Without this, the missed assessment component will not be counted towards the final grade. There are no make-ups allowed.

(4) Attire and safety

You are expected to participate in practical laboratory activities. Some of these activities involve exercise. You are expected to wear appropriate attire for participation, obey laboratory safety rules, and take appropriate care of and return all equipment after use.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognise your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion, and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [NTU Student Academic Integrity Policy and Procedures link](#) in the Student Portal for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Special note: Generative AI tools will be allowed to the extent stipulated for each assignment in the assignment instructions, and any such use must be duly referenced or disclosed.

Course Instructors

Instructor	Office Location	Phone	Email
TBA			

Planned Weekly Schedule

Week	Topic	ILO	Readings/ Activities
1	Lecture: Introduction to environmental exercise physiology	1-5	

	Laboratory report: handout		
2	Lecture: Thermoregulation and fluid balance Laboratory report: data collection	1	Powers, Howley & Quindry Chapter 12; McArdle, Katch & Katch Chapter 25
3	Lecture: Exercise in the heat Part I Laboratory report: data collection	1	Powers, Howley & Quindry Chapter 12; McArdle, Katch & Katch Chapter 25
4	Lecture: Exercise in the heat Part II Laboratory report: data collection	1	Powers, Howley & Quindry Chapter 12; McArdle, Katch & Katch Chapter 25
5	Lecture: Fluid provision during exercise in the heat Laboratory report: data collection	1	Powers, Howley & Quindry Chapter 12; McArdle, Katch & Katch Chapter 2 & 25
6	Lecture: Hyponatraemia Laboratory report: data collection	1	Powers, Howley & Quindry Chapter 12; McArdle, Katch & Katch Chapter 2 & 25
7	Lecture: Air pollution and exercise Laboratory report: write- up	2	Powers, Howley & Quindry Chapter 23
Recess Week			
8	Lecture: Cold Guest Speaker (TBC) Laboratory report: hand-in	4	Powers, Howley & Quindry Chapter 12; McArdle, Katch & Katch Chapters 25
9	Lecture: Altitude Guest Speaker (TBC) Laboratory: Altitude I	4	Powers, Howley & Quindry Chapter 23; McArdle, Katch & Katch Chapter 24
10	Laboratory: Altitude II (External Visit TBC)	4	Powers, Howley & Quindry Chapter 23; McArdle, Katch and Katch Chapter 24
11	Lecture: Sport diving Laboratory: Free diving – NIE swimming pool	3	McArdle, Katch & Katch Chapter 26
12	Lecture: Microgravity and bed rest	5	McArdle, Katch & Katch Chapter 27
13	Online discussion, Q&A and Revision: All Weeks	1-5	

Appendix 1: Assessment Criteria for Laboratory Report (40% Final Grade – marked out of 100)

	A+, A, A-	B+, B	B-, C+, C	D+, D	F
Team: Groupwork and data collection* (max 20)	Clear teamwork, planning and group cohesion with appropriate division of work by each group member contributing to the successful collection of data.	Good teamwork and cohesion, but improvement is needed in the planning of roles by group members for data collection.	Obvious improvements needed in teamwork and cooperation of members to improve data collection.	Team members are working in small cliques with infrequent whole-group cooperation.	Poor teamwork with little or no cooperation among group members during data collection processes.
Individual: Structure and clarity of writing & presentation (max 10)	Well structured. Very minor grammatical and spelling errors. Tables and/or figures are well presented.	Some improvement in structure is possible. Few grammatical and spelling errors. Tables and/or figures are well presented.	Improvement in structure is needed. Obvious grammatical and spelling errors. Tables and figures need improving.	Poor structure. Many spelling and grammatical errors. Poor presentation of tables and figures.	Coherent structure absent. Copious spelling and grammatical errors. Very poor presentation of tables and figures.
Individual: Introduction, background, aims, hypotheses, and objectives (max 20)	Background statement of the problem is clearly defined. Aim clear.	Background statement of the problem could be clearer. Small improvement in defining the aim of the study is needed.	Background statement of the problem and aim need improving.	Background statement and aim are unclear.	Background statement and aim are unclear.
Individual: Methods (max 20)	Comprehensive description of methods.	Good description of methods with few errors.	Methods described but with some errors or omissions.	Methods described as difficult to follow and omissions.	Little coherent description of the methods.
Individual: Data analysis and	Appropriate data analysis applied and	Good data analysis and interpretation of results	Incorrect data analysis in parts and	Poor data analysis and	Inappropriate or very poor data analysis and

interpretation (max 20)	interpretation of results.	with few errors.	interpretation of results incorrect or inappropriate in parts.	interpretation of results.	interpretation of results.
Individual: Discussion and concluding remarks (max 10)	Conclusion(s) clearly related to results.	Conclusion(s) clear with small errors.	Some conclusion(s) are not supported by study results.	Conclusion(s) generally inappropriate or incorrect.	Conclusion(s) unclear, poor, and inappropriate.
*All individuals within the group are expected to contribute to work involved in the planning, data collection and output. Therefore, an individual's score may vary from that of the team based on feedback and observations in this area.					