



**SPORT SCIENCE & MANAGEMENT  
SS1105 FOUNDATIONS OF EXERCISE PHYSIOLOGY**

<b>Pre-requisites</b>	None
<b>No of AUs</b>	3
<b>Contact Hours</b>	Total hours: 39 Lecture: 26 Laboratory: 13

**Course Aims**

This lecture/laboratory course is designed to provide a basic framework that will aid first year students in acquiring knowledge and technical laboratory skills pertinent to the foundations of Exercise Physiology. The lecture material and laboratory techniques allow you to understand the demands of exercise training and how the human body reacts during exercise.

**Intended Learning Outcomes (ILO)**

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

1. Identify the different human energy systems.
2. Articulate how the energy systems affect human performance during exercise.
3. Describe the contribution of different nutrients to energy expenditure.
4. Recognise the role of hormones in responding to exercise training and controlling adaptation.
5. Discuss the effects of different types of exercise training on skeletal muscle.
6. Describe, test and measure energy expenditure during aerobic exercise.
7. Describe the cardiorespiratory responses to exercise and how these change with exercise training.
8. Describe and demonstrate the various methods for the assessment of human body composition.

**Course Content**

The following topics will be covered:

1. Bioenergetics
2. Exercise metabolism
3. Metabolic responses to exercise
4. Hormonal responses to exercise
5. Skeletal muscle structure and function
6. Adaptations to resistance exercise
7. Energy expenditure during exercise
8. Measuring energy expenditure during exercise
9. Cardiovascular responses to endurance exercise
10. Respiratory responses to endurance exercise
11. Adaptations to endurance exercise training

## 12. Body composition and exercise

### Assessment (includes both continuous and summative assessment)

Component	Course ILO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/ Individual	Assessment rubrics
1. Presentation	2, 3, 4, 5, 6	A1, A3, C1, C2, D1	20%	Team	Appendices 1-2
2. Laboratory Report	1-4	A1, A3, B2, C1, C2, D1, E1	20%	Team	Appendices 3-4
3. Examination	1-5, 7, 8	A1, A2, B1, B2, C1	60%	Individual	
Total			100%		

Graduates of the SSM programme should show:

#### Competence

A1: {Understanding}	process and interpret information, evidence and methodologies related to sport science or sport management
A2: {Self-discipline}	independently apply themselves to solve relevant problems
A3: {Modern Tool Usage}	use technology to communicate and provide feedback on sports activities, improve sports performance, monitor and increase physical activity, provide exercise prescription, solve problems for disadvantaged athletes/sportspeople, and commercialize and innovate sports products, events and services

#### Creativity

B1: {Critical Thinking}	critically assess the applicability of sport science and sport management tools toward problems and in the workplace
B2: {Analytical Thinking}	critically analyse data from a multitude of sources
B3: {Interdisciplinary Thinking}	connect the subfields of sport science and sport management to tackle problems
B4: {Innovation}	be able to develop new applications or improve existing techniques

B5: {Entrepreneurship}	develop new ideas and plans for sport science, businesses and events
<b>Communication</b>	
C1: {Effective Communication}	present findings or ideas from sport science and sport management research logically and coherently at the appropriate level for the intended audience and in all forms of communication
C2: {Teamwork}	work in teams on projects that require sport science or sport management application, and communicate results via demonstration, verbally and in written form
<b>Civic-Mindedness</b>	
D1: {Professionalism}	act in a manner that respects the profession and meets the expectations of the sport science and sport management industry
D2: {Inclusiveness}	promote sport and physical activity in all individuals to bring people together and improve physical, social and psychological outcomes
<b>Character</b>	
E1: {Ethical behaviour}	act with integrity and in a socially responsible and ethical manner in line with societal and legal expectations in relation to collecting and analysing data of people and protecting personal data with appropriate computer security
E2: {Sportspersonship}	demonstrate appropriate safety, concern and good conduct in sport situations towards other individuals involved in the activity
<b>Formative feedback</b>	
<p>Feedback for learning will be verbal provided during each laboratory class session where you have the opportunity to learn techniques and apply yourselves to problems related to each organ system.</p> <p>During the completion of the Group Presentation, as a group, you will be provided with verbal feedback pertaining to your assessed performance. Generic verbal and written feedback will be provided to the class for the laboratory report and examination.</p> <p>Throughout the course, you will have opportunity to use recording devices to help record your fellow classmates during practical sessions for observation and analysis. During the learning process, you will receive verbal feedback on the techniques and mistakes in observation and analysis. Suggestions for improvement will be provided.</p>	
<b>Learning and Teaching approach</b>	

<b>Approach</b>	<b>How does this approach support students in achieving the learning outcomes?</b>
Lectures	Lectures will provide information for key learning concepts and theories and support understanding of key concepts
Online learning	Time will be provided for learning from online materials as a part of flip teaching approach. These materials will support key concepts covered in lectures and laboratories.
Presentations	This approach supports you to research and learn independently. You will have the opportunity to explore and gather knowledge (physiology behind the human body, how the energy systems affect human performance, etc.) beyond the classroom. This also provides them with soft skills, such as confidence in delivering clear and concise presentations.
Laboratory Practical Sessions	This approach provides hands-on experiential learning and gives you to learn independently the use of key physiology equipment in the laboratory. You will be able to translate key learning theories into practical application. They will also develop their individual learning abilities and attitudes toward active learning.
Group Laboratory Report	This approach supports you to do research and learn independently through practical laboratory sessions. In groups, you will interpret results and findings to compile a report. This allows you to make a comparison between your findings and the theories. You will also learn how to work and cooperate well with each other in your groups.

### **Reading and References**

Recommended Required Course Texts:

- Powers, S.K., & Howley, E.T. (2015). *Exercise Physiology: Theory and Application to Fitness and Performance*. 9<sup>th</sup> Edition. McGraw-Hill.

Supplemental Additional Reference Text:

- McArdle, W.D., Katch, F.I., & Katch, V.L. (2015). *Exercise Physiology: Nutrition, Energy, and Human Performance*. 8<sup>th</sup> Edition. Lippincott Williams & Wilkins
- Plowman, S.A., & Smith, D.L. (2013). *Exercise Physiology for Health Fitness and Performance*. Lippincott Williams & Wilkins.

### **Course Policies and Student Responsibilities**

#### **General**

You are expected to complete all assigned pre-class readings and activities, attend all laboratory classes punctually and take all scheduled assignments and 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 seminar sessions they have missed. You are expected to participate in all seminar discussions and activities.

#### **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 lecturer via email prior to the start of the class.

### **Absence Due to Medical or Other Reasons**

If you are sick and not able to attend a quiz or a midterm, you have to submit the original Medical Certificate (or relevant document) to the administration to obtain official leave. In this case, the missed assignment component will not be counted towards the final grade. There are no make-up quizzes or make-up midterm.

### **Attire and safety**

You are expected to participate in practical laboratory activities. Some of these activities involve exercise. All of 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 recognize 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 [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Collaboration is encouraged for your work in the class and laboratories because peer-to-peer learning helps you understand the subject better and working in a team trains you to better communicate with others. Working together and exchanging ideas and experiences will help improve the quality of your assessed presentation. It is important to credit others for their contribution to your work which promotes ethical practices and academic integrity.

### **Course Instructors**

Instructor	Office Location	Phone	Email

### **Planned Weekly Schedule**

Week	Topic	Course LO	Readings/ Activities
1	Introduction to bioenergetics	LO1 – LO3	Chapter XX, Pages XX-XX

2	Bioenergetics and exercise metabolism	LO1 – LO3	Chapter XX, Pages XX-XX
3	Metabolic responses to exercise	LO1 – LO3	Chapter XX, Pages XX-XX
4	Hormonal responses to exercise	LO4	Chapter XX, Pages XX-XX
5	Skeletal muscle structure and function	LO5	Chapter XX, Pages XX-XX
6	Adaptations to resistance exercise <b>Group Presentation</b>	LO5	Chapter XX, Pages XX-XX
7	Energy expenditure during exercise	LO6	Chapter XX, Pages XX-XX
8	RECESS WEEK		
9	Measuring energy expenditure during exercise	LO6	Chapter XX, Pages XX-XX
10	Cardiovascular responses to endurance exercise <b>Laboratory Report – Data collection</b>	LO7	Chapter XX, Pages XX-XX
11	Respiratory responses to endurance exercise <b>Laboratory Report – Data collection</b>	LO7	Chapter XX, Pages XX-XX
12	Adaptations to endurance exercise training <b>Laboratory Report – Data collection</b>	LO7	Chapter XX, Pages XX-XX
13	Body composition and exercise	LO8	Chapter XX, Pages XX-XX
14	Revision for exams	LO1 – LO8	Revision for exams

**Appendix 1: Lecturer assessment rubric for Group Presentation (80% of presentation grade)**

	A+, A, A-	B+, B	B-, C+, C	D+, D	F
<b>Quality of presentation (max 25)</b>	Information provided clearly answers the question set out. Presentation is clear and the flow is coherent and logical. Pace is appropriate.	Information mostly answers the question set. Presentation is mostly clear and the flow generally coherent and logical.	There are weaknesses or absences in the information provided and the flow of presentation is unclear at times.	Much of the information provided does not answer the question and the flow is difficult to understand.	Little relevant information and unclear flow.
<b>Familiarity with material (max 40)</b>	Demonstrates a very good understanding of the material. Able to answer questions in a poised and articulate manner with a high level of confidence.	Demonstrates a good understanding of the material. Able to answer most of the questions clearly and with confidence.	Demonstrates a basic understanding of the material. Able to answer some of the questions clearly but lacks confidence at times.	Demonstrates a weak understanding of the material. Has difficulty in answering questions and lacks confidence.	Does not demonstrate any understanding of the material. Unable to answer questions.
<b>Use of technology (max 10)</b>	Uses relevant technology very well to supplement and enhance the quality of presentation.	Good use of technology to improve the presentation.	Some use of technology to help improve the presentation.	Little use of relevant technology in the presentation.	No clear use of technology in the presentation.
<b>Communication and teamwork (max 25)</b>	Communication is very clear and easy to understand. All members of the team make strong, worthwhile contributions.	Communication is clear and easy to understand most of the time. Most members of the team make good contributions.	Communication is unclear at times. Varied contributions of different team members.	Communication is unclear and there and difficult to understand. Most contribution provided by a single team member.	Communication is unclear and not possible to understand. No team member makes worthwhile contribution.

**Appendix 2: Peer evaluation rubric for Group Presentation (20% of presentation grade)**

	A+, A, A-	B+, B	B-, C+, C	D+, D	F
<b>Contribution to presentation development and delivery (max 50)</b>	Individual made a strong contribution to all aspects of development and delivery of presentation.	Individual made worthwhile contribution to most aspects of development and delivery of presentation.	Individual contributed to some aspects of development and delivery of presentation.	Individual made minor contributions to development and delivery of presentation.	Individual made little or no contribution to development and delivery of presentation.
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<b>Teamwork (50)</b>	Individual worked constructively and collaboratively with all other team members.	Individual worked constructively and collaborated well with other team members most of the time.	Individual was constructive and collaborated well with other team members some of the time.	Individual was rarely constructive or collaborative in working with other team members.	Individual was unable to be constructive or collaborate well with other team members.
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>*Other team members to collectively mark X in box next to evaluation for team members name.</i>					

### Appendix 3: Assessment rubric for Laboratory Report (80% of report grade)

Standards	Criteria
A+ to A-	Far exceeding expectations. Demonstrates exceedingly well in laboratory work in handling the physiology equipment, and translating data and applying knowledge into practical work and theories. Group has a very positive attitude towards learning and all members actively contribute during group work.
B+ to B-	Exceed expectations. Demonstrates good knowledge in laboratory work in handling the physiology equipment, translating data and applying knowledge into practical work and theories. Group has a good attitude towards learning and most make an active contribution to the testing and group work.
C+ to C	Meeting expectations. Able to handle equipment most of the time with some supervision, with some difficulties translating data and applying knowledge. Good working attitude and positive behaviour during group work.
D+ to D	Falling below expectations. Need substantial supervision during testing. Struggling with data processing, interpretation and applying knowledge. Work attitude of group can be improved.
F	Failing far below expectations. Unable to work independently. Poor data processing and interpretation with little knowledge translation. Poor attitude and negative behaviour. Uncooperative group work.

**Appendix 4: Peer evaluation rubric for Laboratory Report (20% of report grade)**

	A+, A, A-	B+, B	B-, C+, C	D+, D	F
<b>Contribution to data collection and report (max 50)</b>	Individual made a strong contribution to all aspects of data collection and development of report.	Individual made worthwhile contribution to most aspects of data collection and development of report.	Individual contributed to some aspects of data collection and development of report.	Individual made minor contributions to data collection and development of report.	Individual made little or no contribution to data collection and development of report.
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<b>Teamwork (50)</b>	Individual worked constructively and collaboratively with all other team members.	Individual worked constructively and collaborated well with other team members most of the time.	Individual was constructive and collaborated well with other team members some of the time.	Individual was rarely constructive or collaborative in working with other team members.	Individual was unable to be constructive or collaborate well with other team members.
<i>Insert name of team member*</i>					
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<i>Insert name of team member*</i>					
<i>Insert name of team member*</i>					
<i>*Other team members to collectively mark X in box next to evaluation for team members name.</i>					