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Physical Education and Sports Science
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SPORT SCIENCE & MANAGEMENT
SS2321 EXERCISE PHYSIOLOGY

Academic Year	2025-26	**Semester**	2
Course Coordinator			
Course Code	SS2321		
Course Title	Exercise Physiology		
Pre-requisites	-		
No of AUs	3		
Contact Hours	39		

Course Aims

This course is designed to provide a basic framework that will aid you 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 this course, you should be able to:

1. articulate how the human energy systems affect human performance during exercise.
2. describe the contribution of different nutrients to energy expenditure.
3. describe the response to exercise training in the endocrine, musculoskeletal, cardiovascular, and respiratory systems.
4. describe and demonstrate the various methods for assessing human body composition.
5. apply physiological equipment to assess the performance of different energy systems.

Course Content

The following topics will be covered:

1. Energy expenditure during exercise
2. Measuring energy expenditure during exercise
3. Bioenergetics
4. Exercise metabolism
5. Body composition and exercise
6. Metabolic responses to exercise

7. Hormonal responses to exercise
8. Skeletal muscle structure and function
9. Adaptations to resistance exercise
10. Cardiovascular responses to endurance exercise
11. Respiratory responses to endurance exercise
12. Adaptations to endurance exercise training

NTU Competencies & Graduate Attributes

NTU Competencies	
Character	√
Competence	√
Cognitive agility	√

NTU Graduate Attributes	
Graduate Attributes	Level (i.e., basic, intermediate, advanced)
1. Decision Making	Basic
2. Project Management	Intermediate
3. Critical Thinking	Intermediate
4. Collaboration	Advanced

Assessment (includes both continuous and summative assessment)

Component	**ILO Tested**	**Weighting**	**Team/ Individual**	**Assessment Rubrics**
1. Group Presentation	1, 2	25%	Team	Appendix 1, 3
2. Laboratory Report	1, 2, 3, 5	25%	Team	Appendix 2, 3
3. Final Examination	1-5	50%	Individual	
Total		100%		

Formative Feedback

Feedback for learning will be verbally provided during each laboratory class session, where you have the opportunity to learn physiology laboratory techniques and apply yourselves to problems related to real-world scenarios.

After completing the presentation, you will receive written feedback on your assessed performance as a group. In addition, written feedback will be provided to the group for the laboratory report, and generic feedback will be provided to the class for the examination.

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.
Online Learning	Time will be provided for learning from online materials as a part of the 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 develops your soft skills, such as confidence in delivering clear and concise presentations.
Laboratory Practical Sessions	This approach provides hands-on experiential learning and allows you to learn independently using key physiology equipment in the laboratory. As a result, you will be able to translate key learning theories into practical applications. You will also develop individual learning abilities and attitudes toward active learning.
Group Laboratory Report	This approach supports your research and learning 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

NIE Research and Publications

1. Latella, C., Goodwill, A. M., Muthalib, M., Hendy, A. M., Major, B., Nosaka, K., & Teo, W. P. (2019). Effects of eccentric versus concentric contractions of the biceps brachii on intracortical inhibition and facilitation. *Scandinavian journal of medicine & science in sports*, *29*(3), 369–379. https://doi.org/10.1111/sms.13334

2. Mason, J., Frazer, A. K., Pearce, A. J., Goodwill, A. M., Howatson, G., Jaberzadeh, S., & Kidgell, D. J. (2019). Determining the early corticospinal-motoneuronal responses to strength training: a systematic review and meta-analysis. *Reviews in the neurosciences*, *30*(5), 463–476. https://doi.org/10.1515/revneuro-2018-0054

3. Goodwill, A. M., Pearce, A. J., & Kidgell, D. J. (2012). Corticomotor plasticity following unilateral strength training. *Muscle & nerve*, *46*(3), 384–393. https://doi.org/10.1002/mus.23316

Other Readings and References

Core Text:

4. Powers, S.K., Howley, E.T. & Quindry, J. (2021). ISE Exercise Physiology: Theory and Application to Fitness and Performance. 11th Edition. McGraw-Hill.

Any additional readings will be posted on NTULearn.

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	Energy expenditure during exercise	1	Chapter 1
2	Measuring energy expenditure during exercise	1	Chapter 1
3	Introduction to bioenergetics	1, 2, 5	Chapter 3
4	Bioenergetics and exercise metabolism	1, 2, 5	Chapters 3, 4
5	Metabolic responses to exercise	1, 2, 5	Chapter 4
6	Body composition and exercise	4	Chapters 18, 22
7	Hormonal responses to exercise	3	Chapter 5
Recess Week			
8	Skeletal muscle structure and function	3	Chapter 8
9	Adaptations to resistance exercise	3	Chapter 14
10	Cardiovascular responses to endurance exercise	3,	Chapter 9
11	Respiratory responses to endurance exercise	3	Chapter 10
12	Adaptations to endurance exercise training	3	Chapter 13
13	Revision	1-4	

Appendix 1: Assessment Criteria for Group Presentation (25% Final Grade including peer evaluation, marked out of 100)

	A+, A, A-	B+, B	B-, C+, C	D+, D	F
Quality of presentation (max 20)	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 is generally coherent and logical.	There are weaknesses or absences in the information provided, and the flow of the 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.
Demonstration of material (max 40)	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 answering questions and lacks confidence.	Does not demonstrate any understanding of the material. Unable to answer questions.
Use of technology (max 10)	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.

Communication and teamwork* (max 20)	Communication is very clear and easy to understand. All members of the team make active 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 contributions are provided by a single team member.	Communication is unclear and not possible to understand. No team member makes an active contribution.
*All individuals within the group are expected to contribute to work involved in the planning, data collection and output. An individual's score may vary from that of the team based on feedback and observations in this area.					

Appendix 2: Assessment Criteria for Laboratory Report (25% total grade including peer evaluation, marked out of 100)

	A+, A, A-	B+, B	B-, C+, C	D+, D	F
Groupwork and data collection* (max 40)	Clear teamwork, planning and group cohesion with appropriate division of work by each group member contributing to the successful collection of data. Demonstrates exceedingly well in laboratory work in handling the physiology equipment.	Good teamwork and cohesion, but improvement is needed in the planning of roles by group members for data collection. Demonstrates good knowledge in laboratory work in handling the physiology equipment.	Obvious improvements are needed in teamwork and cooperation of members to improve data collection. Sufficient handling of equipment with prompting and supervision.	Team members were working in small cliques with infrequent whole group cooperation. Insufficient ability to handle equipment and needs substantial supervision.	Poor teamwork with little or no cooperation among group members during data collection processes. Unable to work independently in the laboratory.
Structure and clarity of writing presentation (max 10)	Well structured. Very minor grammatical and spelling errors.	Some improvement in structure is possible. Few grammatical and spelling errors.	Improvement in structure is needed. Obvious grammatical and spelling errors.	Poor structure. Many spelling and grammatical errors.	Coherent structure absent. Copious spelling and grammatical errors.
Interpretation & discussion of data (max 40)	Appropriate interpretation of results and excellent ability to apply knowledge to practical work and theory	Good interpretation of results and good ability to apply knowledge to practical work and theory	Incorrect interpretation of results in parts and sufficient ability to apply knowledge to practical work and theory	Poor interpretation of results and insufficient ability to apply knowledge to practical work and theory	Inappropriate or very poor data interpretation and very poor ability to apply knowledge to practical work and theory
*All individuals within the group are expected to contribute to work involved in the planning, data collection and output. An individual's score may vary from that of the team based on feedback and observations in this area.					

Appendix 3: Peer Evaluation Component for Presentation

For the peer evaluation component, group members within each group will be asked to rate each of their peers, and the score received for each group member will be the average of the scores from their peers' round to the nearest integer (e.g., student gets a score of 9, 8 and 8, respectively from the 3 other group members and will receive a score of 8 (average of 8.3).

Marks	10, 9	8, 7	6, 5	4, 3	2, 1, 0
Peer Evaluation **(10 max)**	Excellent work; was a crucial component of the group's success.	Very strong work; contributed significantly to the group.	Sufficient effort; contributed adequately to the group.	Insufficient effort; met minimal standards of the group.	Little or weak effort; was detrimental to the group.

NB: Numeric scores for peer review do not necessarily align with the letter grade categories.