

SPORT SCIENCE & MANAGEMENT
SS3321 APPLIED PHYSIOLOGY AND PERFORMANCE

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|---------------------------|------------------------------------|-----------------|---|
| Academic Year | 2025-26 | Semester | 1 |
| Course Coordinator | | | |
| Course Code | SS3321 | | |
| Course Title | Applied Physiology and Performance | | |
| Pre-requisites | - | | |
| No of AUs | 3 | | |
| Contact Hours | 39 | | |

Course Aims

A lecture/laboratory course designed to provide a basic framework that will aid you in acquiring knowledge and technical laboratory skills pertinent to exercise physiology. The laboratory techniques and knowledge will help you understand the demands of training on the body and will enable them to prescribe exercise or training for optimal health and elite performance. Emphasis will be placed on the energy systems and the prediction of performance in endurance and high-intensity events. The importance of psychophysical responses to muscular effort and the ratings to different assessment modes will also be emphasised.

Intended Learning Outcomes (ILO)

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

1. explain the contribution of the different energy systems/metabolism to sports performance.
2. choose and demonstrate appropriate tests to measure the energy contribution to high-intensity exercise and interpret output data from the tests.
3. select and demonstrate appropriate tests to measure the energy contribution during endurance exercise and interpret output data from the tests.
4. discuss different methods of prediction of performance and assess perceived exertion during endurance exercise events.
5. explain the relationship of perceived exertion to physiological measures during exercise.

Course Content

The following topics will be covered:

1. Energy system contribution to high-intensity exercise.

2. Understanding predictors of performance.
3. The metabolic processes which are anaerobic ("without oxygen") and aerobic ("with oxygen").
4. The influence of maximal oxygen uptake on endurance performance.
5. Factors that also influence endurance performance.
6. Lactate/ventilatory threshold and use in predicting endurance performance.
7. The body composition and rate of perceived exertion during sporting performance.

NTU Competencies & Graduate Attributes

NTU Competencies

| | |
|-------------------|---|
| Character | √ |
| Competence | √ |
| Cognitive agility | √ |

NTU Graduate Attributes

| Graduate Attributes | Level (i.e., basic, intermediate, advanced) |
|----------------------|---|
| 1. Adaptability | Intermediate |
| 2. Collaboration | Intermediate |
| 3. Communication | Intermediate |
| 4. Creative Thinking | Intermediate |
| 5. Critical Thinking | Intermediate |

Assessment (includes both continuous and summative assessment)

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

Formative Feedback

Formative feedback will be provided continuously during lectures and laboratory sessions. Questions will be asked during lectures and laboratory sessions, and you will receive feedback regarding your responses. General feedback and review will also be provided in class after the submission of each laboratory assignment. General written feedback on the test will be provided.

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 |

| | |
|---------------------|---|
| Laboratory Sessions | The laboratory sessions will help you understand and apply the concepts learnt in class through practical sessions. |
|---------------------|---|

Reading and References

NIE Research and Publications

1. Balasekaran, G., Loh, M. K., Boey, P., & Ng, Y. C. (2023). Determination, measurement, and validation of maximal aerobic speed. *Scientific Reports*, 13(1), 8006.
2. Balasekaran, G., Loh, M. K., Boey, P., & Ng, Y. C. (2023). Running Energy Reserve Index (RERI) as a new model for assessment and prediction of world, elite, sub-elite, and collegiate running performances. *Scientific Reports*, 13(1), 7416.
3. Balasekaran, G., Mayo, M., & Ng, Y. C. (2023). Effects of large exercise-induced weight loss on insulin sensitivity and metabolic risk factors in young males with obesity. *The Journal of sports medicine and physical fitness*.
4. Balasekaran, Govindasamy, Visvasuresh Victor Govindaswamy, Boey Peck Kay Peggy, and Ng Yew Cheo. (2021). *Applied Physiology of Exercise*. World Scientific.
5. Balasekaran, Govindasamy, Visvasuresh Victor Govindaswamy, Boey Peck Kay Peggy, and Ng Yew Cheo. (2021). *Applied Physiology of Exercise Laboratory Manual*. World Scientific.
6. Balasekaran, G., & Robertson, R. J. (2020). *Curricular Guide to Health Fitness Applications in Physical Education Using the OMNI Perceived Exertion Scale*. Pearson Education South Asia Pte Limited.
7. Balasekaran, G., Mayo, M., & Lim, J. (2019). Fat distribution and metabolic risk factors of young obese males following the cessation of training: A follow-up. *Translational Sports Medicine*, 2(2), 82-89.
8. Balasekaran, G., Loh, M. K., Govindaswamy, V. V., & Robertson, R. J. (2012). OMNI Scale of Perceived Exertion: mixed gender and race validation for Singapore children during cycle exercise. *European journal of applied physiology*, 112(10), 3533-3546.
9. Balasekaran, G., Loh, M. K., Govindaswamy, V. V., & Cai, S. J. (2014). Omni Scale Perceived Exertion responses in obese and normal weight male adolescents during cycle exercise. *The Journal of sports medicine and physical fitness*, 54(2), 186-196.
10. Mayo, M. J., Grantham, J. R., & Balasekaran, G. O. V. I. N. D. A. S. A. M. Y. (2003). Exercise-induced weight loss preferentially reduces abdominal fat. *Medicine and science in sports and exercise*, 35(2), 207-213.

Other Readings and References

11. Plowman, S. A., & Smith, D. (2017). *Exercise physiology: For health, fitness, and performance*. Philadelphia: Wolters Kluwer.

12. Powers, S. K., & Howley, E. T. (2018). Exercise physiology: Theory and application to fitness and performance. New York, NY: McGraw-Hill Education.

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 | Bioenergetics | 1 | To be assigned weekly |
| 2 | Energy Systems during Exercise | 1 | |
| 3 | Cardiorespiratory Responses to Exercise | 1,3 | |
| 4 | Maximum Oxygen Uptake | 1,3,4,5 | |
| 5 | Lactate Threshold | 1,3,4,5 | |
| 6 | Ventilatory Threshold | 1,3,4,5 | |
| 7 | Prediction of Endurance Exercise | 1,3,4 | |
| Recess Week | | | |
| 8 | High-Intensity Exercise Training | 1,2 | To be assigned weekly |
| 9 | Measuring High-Intensity Exercise | 1,2 | |
| 10 | Tests for Anaerobic Exercise | 1,2 | |
| 11 | Perceived Exertion | 5 | |
| 12 | Body Composition and Physiological Responses | 5 | |
| 13 | Revision | 1,2,3,4,5 | |

Appendix 1: Assessment Criteria for Laboratory Work Assignment (40% Final Grade)

| | A+, A, A- | B+, B | B-, C+, C | D+, D | F |
|--|--|--|---|--|--|
| Presentation and definition of the concepts (30 marks) | Explanation of the theory is very clear and coherent. | Explanation of the theory is mostly clear, and the flow is generally coherent. | Explanation of the theory is somewhat clear, and the flow is somewhat coherent. | There are weaknesses or absences in the theoretical constructs provided, and the flow of presentation is unclear at times. | Much of the information provided does not help to define the concept, and the flow is difficult to understand. |
| Application of theoretical knowledge to practical contexts (10 marks) | Very Clear demonstration of how theory can be applied to practice. | More than adequate evidence to show how theory can be applied to practice. | Adequate evidence to show how theory can be applied to practice. | Inadequate evidence to show how theory can be applied to practice. | Little evidence to show how theory can be applied to practice. |