



Course Outline
KNES 503.04: Physiology of Athletic Performance
Winter 2013

Instructor: Dr. Brian MacIntosh	Dr. Erik Groves	Room: SA 119
Phone: 403-220-3421	403-220-4927	Days: MWF
Email: Brian.macintosh@ucalgary.ca	emgroves@ucalgary.ca	Time: 14:00 to 14:50
Office: KNB 140B	KNB 428	Course Website: On Blackboard
Office Hours: By appointment	By appointment	

Course Description:	In this course, the principles of training and physiological factors affecting physical performance will be studied with consideration for the experimental evidence.
Prerequisites:	Students taking this course must have already taken Exercise Physiology (KNES 373)
Course Objectives:	<p>In taking this course, the student will have an opportunity to review the physiological principles that are critical to athletic performance, and extend the study of these principles to include the chronic adaptations that occur as a result of regular training practices. In particular, the student will learn to challenge practices that are founded in empirical knowledge, looking for experimental evidence to justify or dispute such practices. Specific objectives of the course are the following:</p> <ol style="list-style-type: none">1. to review the physiological principles of athletic performance2. to become familiar with current literature in the physiology of sport3. to learn how to critically evaluate the scientific literature4. to formulate a working knowledge of physiological factors affecting athletic performance and the manner in which training can induce changes in these physiological systems5. to recognize the limitations of our knowledge with respect to experimental evidence for factors affecting athletic performance and the scientific basis of training procedures.
Required Reading Materials:	<p>Students are expected to have access to a good Exercise Physiology text like one of the ones listed below (or more recent edition). Furthermore, it is anticipated that students will consult the scientific literature. Examples of journals that may be useful for this information are listed below.</p> <p>RECOMMENDED TEXTS</p> <ol style="list-style-type: none">1. McArdle, W.D., Katch, F.I. and Katch, V.L. Exercise Physiology: Energy Nutrition and Human Performance. (7th Edition). Wolters Kluwer 2010.2. Brooks, G.A., Fahey, T.D. White, T.P. and Baldwin, K. Exercise Physiology: Human Bioenergetics and its Applications. (fourth edition) McGraw-Hill, Toronto, ON, 2004.3. Powers, S.K. and Howley, E.T. Exercise Physiology: Theory and Application. (7th Edition) McGraw-Hill, Toronto, 2007.4. Kenney, W.L., Wilmore, J.H., and Costill, D.L. Physiology of Sport and Exercise (5th Edition) Human Kinetics, Champaign, Ill 2012.
Scientific Journals:	(some of these journals and many others are available on-line)

Medicine and Science in Sports and Exercise
 Journal of Applied Physiology
 European Journal of Applied Physiology
 Int. J. of Sports Medicine
 Applied Physiology, Nutrition and Metabolism, (formerly Can. J. Appl. Physiol. And
 before that: Canadian Journal of Sport Sciences)
 and others...

Note: The Journal of Strength and Conditioning Research, in the opinion of the instructors, is not considered a rigorous journal. Exercise caution (critical thinking) when you use this journal as a reference source.

Additional resource material will be placed on (or linked to from) Blackboard. Lecture notes will be placed on this site.

Contacting the Instructor:

Students requiring assistance are encouraged to speak with the instructor(s) during/immediately after class. Should you wish to meet with the instructor, please phone or email the instructor to make an appointment. Questions relating to course material, and the response from the instructor, may be posted (anonymously) to Blackboard. Email, is the most effective method of communication with your instructor, but the volume of e-mail received may slow the response time. If you have not received a suitable response within 24 hour, resend your request or contact the instructor by phone.

Grading Scale:

Grade	Percent	Grade Point Value	Description
A+	93.0 & above	4.00	Outstanding
A	89.0-92.9	4.00	Excellent - superior performance, showing comprehensive understanding of subject matter.
A-	85.0-88.9	3.70	
B+	81.0-84.9	3.30	
B	77.0-80.9	3.00	Good-clearly above average performance with knowledge of subject matter generally complete.
B-	73.0-76.9	2.70	
C+	69.0-72.9	2.30	
C	65.0-68.9	2.00	Satisfactory – basic understanding of the subject matter. Grade point average below 2.00 is not sufficient for promotion.
C-	61.0-64.9	1.70	Minimum grade required if needed as a prerequisite
D+	55.0-60.9	1.30	
D	50.0-54.9	1.00	Minimal pass – marginal performance; generally insufficient preparation for subsequent courses in the same subject.
F	49.9 & below	0	Fail – unsatisfactory performance or failure to meet course requirements.

Evaluation of Course Content: Evaluation in this course will be based on classroom quizzes, midterm and final exams and two assignments. A minimum of eight quizzes will be given, and your best five will count toward the 10% grade (2% each). These may or may not be announced, and will be based on current lecture material and reading assignments. The final exam will cover material studied since the midterm exam. The criteria for the assignments (2 article critiques) are given at the end of this course outline.

classroom quizzes:	10 %	
midterm exam:	25 %	Feb 13
two article critiques: 1.	10 %	due: Feb 25 (automatic extension to Mar 4, but no longer)
2.	25%	due: Mar 27 (automatic extension to April 5, but don't ask for any longer)
final exam:	30 %	scheduled by the registrar

Final Examination: To be scheduled by Registrar's Office.

LECTURE TOPICS/SCHEDULE (Rx refers to reading list)

- Jan 9 Introduction: Nature of the course, and the sources of scientific information
- Jan 11 Physiological determinants of athletic performance (strength, power, energy, endurance)
- Jan 14 The Intensity Duration Relationship as determinant of athletic performance R1
- Jan 16 Quantifying the Intensity duration relationship R2
- Jan 18 Determinants of the Intensity duration relationship
- Jan 21 More Intensity-duration relationship
- Jan 23 How to Critique a scientific paper: R3
- Jan 25 Continue
- Jan 28 Continue
- Jan 30 Critical Power and Critical Speed R4
- Feb 1 Anaerobic Energy: What is it good for?
- Feb 4 Measuring Anaerobic Capacity R5
- Feb 6 Comparing Anaerobic Capacity and Maximal Accumulated Oxygen Deficit R6
- Feb 8 Elite sprint athletes
- Feb 11 what is the limit to 100 m sprint performance? R7
- Feb 13 Fiber type, fatigue and optimal velocity R8
- Feb 15 **Midterm Exam**
- Feb 17-22 reading week
- Feb 25 Is Maximal Oxygen Uptake Important? R9
- Feb 27 Measuring Maximal Oxygen Uptake R10
- Mar 1 Defining and Measuring Efficiency and Economy R11
- Mar 4 Energetics of athletic performance; economy and efficiency
- Mar 6 Contrasting Efficiency and Economy
- Mar 8 Warm-up: What is it good for? R12
- Mar 11 Oxygen Uptake Kinetics R13
- Mar 13 Postactivation Potentiation R14
- Mar 15 Muscle Temperature and Power Output R15
- Mar 18 Stretching: Does it enhance or diminish performance? R16
- Mar 20 Changing muscle fibre types R17
- Mar 22 Consequences of altered fibre types
- Mar 25 Considerations for elite endurance athletes

- Mar 27 Training for a marathon
- Mar 29 Good Friday
- Apr 1 Training for a marathon: is sub 2 hours possible? R18
- Apr 3 Considerations for the total package: 2 hour marathon: male or female?
- Apr 5 Tour de France Cyclists: Physiology of Lance and Miguel R19
- Apr 8 Ergogenic Aids: an overview and ethical questions
- Apr 10 Ergogenic Aids: creatine monohydrate R20
- Apr 12 Ergogenic Aids: caffeine R21
- Apr 15 Ergogenic Aids: Discussion

Readings; additional readings will be posted to or linked to from Blackboard.

R	Article or Reading
1	<p>Monod, H. and J. Scherrer (1965). "The work capacity of a synergic muscular group." <u>Ergonomics</u> 8: 329-338.</p> <p>Moritani, T., A. Nagata, et al. (1981). "Critical power as a measure of physical work capacity and anaerobic threshold." <u>Ergonomics</u> 24(5): 339-350.</p> <p>Hill, D. W. (1993). "The critical power concept. A review." <u>Sports Med</u> 16(4): 237-254.</p>
2	<p>Vandewalle, H., J. F. Vautier, et al. (1997). "Work-exhaustion time relationships and the critical power concept. A critical review." <u>J Sports Med Phys Fitness</u> 37(2): 89-102.</p> <p>Jan 25: Walsh, M. L. (2000). "Whole body fatigue and critical power: a physiological interpretation." <u>Sports Med</u> 29(3): 153-166.</p>
3	<p>de Aguiar, R.A., T. Turnes, R.S. de Oliveira Cruz, and F. Caputo. (2012) VO2 responses to running speeds above intermittent critical speed. <u>Int J Sports Med</u> 33: 892-897 DOI http://dx.doi.org/10.1055/s-0032-1311595.</p>
4	<p>Jones, A. M., A. Vanhatalo, et al. (2010). "Critical power: implications for determination of V O2max and exercise tolerance." <u>Medicine and Science in Sports and Exercise</u> 42(10): 1876-1890.</p>
5	<p>Green, S. (1994). "A definition and systems view of anaerobic capacity." <u>Eur J Appl Physiol Occup Physiol</u> 69(2): 168-173.</p>
6	<p>Medbø, J. I., A. C. Mohn, et al. (1988). "Anaerobic capacity determined by maximal accumulated O2 deficit." <u>J Appl Physiol</u> 64(1): 50-60.</p> <p>Hill, D. W. and J. C. Smith (1993). "A comparison of methods of estimating anaerobic work capacity." <u>Ergonomics</u> 36(12): 1495 - 1500.</p>
7	<p>Beneke, R. and M.J.D. Taylor (2010) What gives Bolt the edge – A.V. Hill knew it already!</p>
8	<p>MacIntosh, B.R.M., K. Svedahl and M. Kim (2004) Fatigue and optimal conditions for short-term work capacity. <u>Eur. J. Appl. Physiol.</u> 92: 369-375.</p> <p>Smith, J. C. and D. W. Hill (1991). "Contribution of energy systems during a Wingate power test." <u>Br J Sports Med</u> 25(4): 196-199.</p>
9	<p>Taylor, H. L., E. Buskirk, et al. (1955). "Maximal oxygen intake as an objective measure of cardio-respiratory performance." <u>J Appl Physiol</u> 8(1): 73-80.</p> <p>Robergs, R. A., D. Dwyer, et al. (2010). "Recommendations for improved data processing from expired gas analysis indirect calorimetry." <u>Sports Medicine</u> 40(2): 95-111.</p>
10	<p>Bassett, D. R., Jr. and E. T. Howley (2000). "Limiting factors for maximum oxygen uptake and determinants of endurance performance." <u>Med Sci Sports Exerc</u> 32(1): 70-84.</p>
11	<p>Fletcher, J.R., S.P. Esau and B.R. MacIntosh (2009) Economy of running: beyond the measurement of oxygen uptake. <u>J. Appl. Physiol.</u> 107: 1918-1922.</p>
	<p>Jones, A. M. and H. Carter (2000). "The effect of endurance training on parameters of aerobic fitness." <u>Sports Med</u> 29(6): 373-386.</p>

ARTICLE CRITIQUE

As part of the requirements for this course, you must critically evaluate 2 research papers. To write a critique, you are evaluating several aspects of the paper, and the following guidelines should help. (adapted from Thomas and Nelson, 1990). The length of your critique can be no longer than 10 pages, excluding title page, abstract, figures and references. Use these titles to organize your paper!

- A. Overall (most important)
 - 1. Is the paper a significant contribution to knowledge about the area?
- B. Introduction and Review of Literature
 - 1. Is the research plan developed within a reasonable theoretical framework?
 - 2. Is current and relevant research cited and properly interpreted?
 - 3. Is the statement of the problem clear, concise, testable, and derived from the theory and research reviewed?
- C. Method
 - 1. Are relevant subject characteristics described and are the subjects appropriate for the research?
 - 2. Is the instrumentation appropriate?
 - 3. Are testing/treatment procedures described in sufficient detail?
 - 4. Are statistical analyses and research design sufficient?
- D. Results
 - 1. Do the results evaluate the stated problem?
 - 2. Is the presentation of results complete?
 - 3. Are the tables and figures appropriate, and without redundancy?
- E. Discussion
 - 1. Are the results discussed?
 - 2. Are the results related back to the problem, theory, and previous findings?
 - 3. Is there excessive speculation?
 - 4. Is external validity appropriately adhered to?
- F. References
 - 1. Are all references in the correct format and are they complete?
 - 2. Are the results related back to the problem, theory, and previous findings?
 - 3. Are all dates in the references correct and do they match the text citations?
- G. Abstract
 - 1. Does the abstract include: a statement of the purpose, description of subjects, instrumentation, and procedures, and a report of meaningful findings?
 - 2. Is the abstract the proper length?
- H. General
 - 1. Are key words provided?
 - 2. Does the paper provide for use of nonsexist language, protection of human subjects, and appropriate labeling of human subjects?

For your first critique, you will evaluate **one** of the following papers (I would suggest that you read both of them):

1. Vitor, F. D.M., and M.T.S. Bohme (2010) Performance of young male swimmers in the 100-meters front crawl. *Pediatric Exercise Science* 22: 278-287.
2. Miura, A., C. Shiragiku, Y. Hirotooshi, A. Kitano, M.Y. Endo, T.J. Barstow, R.H. Morton and Y. Jukuba. (2009) *Appl. Nutr. Metab.* 34:1001-1007.

2.

For your second critique, you will evaluate **one** of the papers identified on blackboard for his purpose:

FORMAT OF SUBMITTED WORK: (see author guidelines for “Applied Physiology, Nutrition and Metabolism”

The description of format for submitted work has been extracted, (with only minor modifications), from the Canadian Journal of Applied Physiology Instructions for Authors (available at above web site). It is highly recommended that you consult examples from this journal before you submit your work. Examples from former students may not be appropriate. One major exception to the format of the journal is that you are not required to organize your critique in the sections typically seen in a scientific paper (Introduction, Methods, Results and Discussion). You will be required to have an abstract, which will be a summary of your paper. You will also be required to have an Introduction, which will provide the reader with the background necessary to understand what you have written, and why. After the Introduction, any subheadings will be up to you, but may reflect different aspects of the critique. It is recommended that you follow the headings used by Thomas and Nelson (1990) and presented above (alphabetical and numerical).

All parts of the submitted paper, including references, must be typewritten (12 point font), double spaced, on paper 8.5 x 11 in. with margins 2.4 cm (1 in.).

The first (Title) page should contain only the title of your paper, author's name, the course name and number, and the instructor's name. The title page, although not numbered, is considered to be page 1, and all remaining pages must be numbered in the top right-hand corner, beginning with the abstract, as page two.

Your critique cannot be more than 10 pages, excluding title page, abstract, figures and references. Therefore, your last text page should be # 12. References, Tables and Figures follow this.

Spelling should follow that of either the Shorter Oxford English Dictionary or Webster's Third New International Dictionary. Use your computer spell-check! Abbreviations and Symbols for units of measure should conform to international recommendations. Metric or S.I. units should be used or equivalents given.

Abbreviations and contractions of the names of substances, procedures, etc. must be defined the first time that they are used. Symbols and Greek letters should be written clearly (if necessary). Superscripts and subscripts should be appropriately placed, and should be explained by marginal notes when necessary.

Titles are to have no more than 85 characters, including spaces between words. A short running title of no more than thirty (30) characters may be used. The running title should be placed as a header on each page after the title page.

An abstract is required. It should not exceed 200 words (use the word count function). It must be suitable for use by abstracting journals, e.g. Biological Abstracts, without rewording. Following each abstract, provide up to five (5) key words or phrases, which are not included in the title. The abstract and key words constitute page two of the report. See if you can improve on the key words provided by the authors of the paper you are critiquing.

Tables (if needed) should be numbered consecutively, using Arabic numerals. They should be typed with double-spacing and placed in the appropriate place within the body of the paper. Presentation of mean values should be accompanied by measures of dispersion (i.e. \pm SEM). Vertical rules (lines) must be avoided. Figures should be numbered consecutively with Arabic numerals. Each figure can be placed at the appropriate position in the paper, or all of them can be placed sequentially at the back of the paper, after the Tables. Figure captions should accompany each figure, or the captions can be presented in an accumulated fashion

immediately prior to the figures. Each caption gives a brief description of the figure contents, and provides descriptive information required for interpretation of the contents of the figure.

References within the text must follow Physiology Society format, e.g. (Smith, 1978). If the reference has more than two authors, only the first is named; this is followed by et al., e.g. (Quinn et al., 1964). You should limit the number of citations at any point in the text to three items (e.g. A review of the literature (Jones, 1932; Tino, 1977a; Maybee and Orr, 1956) reveals that ...). Depending upon the construction of the sentence, the names may or may not be placed in parentheses, but the year always is. If there is more than one publication by the same author in any one year, references should be distinguished by a, b, c, etc. after the year (e.g. MacIntosh, 1993a).

The reference list should be placed at the end of the text (before the Tables and Figures). Citations should appear in alphabetical order, according to the surnames of the first authors. In each citation, the surname of the other authors should follow. Initials should follow the surnames throughout. The citations should then give in order: year, title of the paper, name of the periodical (bolded and written in full or abbreviated according to Chemical Abstracts), volume, and inclusive page numbers. Reports not yet accepted for publication and private communications must be placed in parentheses in the text. No foot-notes are to be used in the text.

Examples of the correct reference format are presented above in your reading list.

SUPPLEMENTARY COURSE INFORMATION

In accordance with the University of Calgary Calendar

Academic Accommodation Awareness Information:

It is the student's responsibility to request academic accommodation. If you are a student with a documented disability who may require academic accommodation and have not registered with the Disability Resource Centre, please contact their office at 220-8237. You are also required to discuss your needs with your instructor no later than fourteen (14) days after the commencement of this course. Students who have not registered with the Disability Resource Centre are not eligible for formal academic accommodation.

Plagiarism/Cheating/Other Academic Misconduct: (see Calendar)

A single offence of cheating, plagiarism, or other academic misconduct is a serious act that will not be tolerated in the Faculty of Kinesiology. Penalties for such acts will be determined by the Dean and may result in a failing grade, probation, suspension, or expulsion. Any student who is uncertain if an action falls into this category should consult the instructor and/or the Calendar.

Midterm Exam Policy:

The Faculty of Kinesiology policy is that all students are expected to write midterm exams on the dates listed on the course outline. Special accommodation may be granted by the instructor in **exceptional circumstances only** which include illness, participation in athletic events (varsity, national or international), domestic affliction, and religious conviction. It is the student's responsibility to supply proper documentation and/or notification **prior** to the originally scheduled midterm to support their circumstance. Personal travel plans and arrangements are **not** valid reasons for requesting a special accommodation for a midterm exam. Failure to comply with this policy will result in a grade of zero for the midterm and possible failure in the course.

FOIP Policy:

Please note that the University is under the jurisdiction of the provincial Freedom of Information and Protection of Privacy (FOIP) Act. Please refer to the website for details: <http://www.ucalgary.ca/secretariat/privacy>

**Internet and Electronic
Communication Device
Information:**

Any surfing of the Internet during lectures that is not directly related to the class discussion is distracting and strictly forbidden. Additionally, the use of any electronic devices (e.g., cellular phones, Blackberrys) for e-mailing, texting, etc. is strictly prohibited. Please turn OFF your phone before the beginning of each lecture.

Instructors have the authority, at the discretion of the dean of their faculty, to require that specific course assignments, term papers and academic exercises be submitted in an electronic format. Instructors cannot require that multiple copies of an assignment be submitted.

**Emergency
Evacuation/Assembly
Points:
Safewalk Information:**

For classes in the Kinesiology buildings Primary assembly point is the MacEwan Student Centre - North Courtyard and the Alternate assembly point is University Theatres Lobby

Safewalk volunteers walk people safely to their destination on campus (including Health Sciences, Children's Hospital, McMahon Stadium, and University LRT station). This service is free and available to students, staff and campus visitors. Call 403-220-5333 (24 hours a day/7 days a week/365 days a year).

Student's Union:

The Kinesiology Representative is Calindy Ramsden - E-mail:

kinesrep@su.ucalgary.ca.