



# HK\*4340 Genomics: Exercise and Disease - DRAFT

Fall 2021

Section(s): C01

Department of Human Health and Nutritional Sciences

Credit Weight: 0.50

Version 1.00 - July 05, 2021

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## 1 Course Details

### 1.1 Calendar Description

This course is an in-depth examination of how exercise 1) effects gene transcription to influence elite performance (ie. training for sport) and 2) can be used as a therapeutic strategy to influence the expression of specific genes to recover the health of an individual (ie. exercising for health). The course represents a unique opportunity to understand the beneficial effects of physical activity and exercise at the genetic level.

**Pre-Requisites:** NUTR\*3360

### 1.2 Course Description

This course is an in-depth examination that first examines how exercise effects gene transcription to influence elite performance and secondly applies this foundation knowledge to better understand disease progression and exercise as a preventative approach improve the health of an individual (ie. exercising for health). The course represents a unique opportunity to understand the beneficial effects of physical activity and exercise at the genetic level, and aims to integrate foundation knowledge previously acquired, while expanding these concepts with the use of current/cutting-edge scientific papers.

### 1.3 Timetable

Lectures will be given live and in person (face-to-face) every Tuesday and Thursday mornings from 10-11:20. Lectures will also be streamed live and taped during these times and posted on courselink afterwards to ensure everyone has access to the material.

### 1.4 Final Exam

TBD

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## 2 Instructional Support

## 2.1 Instructional Support Team

<b>Instructor:</b>	Dr. Graham Holloway
<b>Email:</b>	ghollowa@uoguelph.ca
<b>Telephone:</b>	+1-519-824-4120 x53688
<b>Office:</b>	ANNU 332
<b>Office Hours:</b>	A time to hold online office hours will be determined during the first class, but are usually held on Mondays or Fridays.

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## 3 Learning Resources

### 3.1 Required Resources

#### Courselink (Website)

<https://courselink.uoguelph.ca>

This course will make use of the University of Guelph's course website on D2L (via Courselink). Consequently, you are responsible for all information posted on the Courselink page for HK\*4340. Please check it regularly. Slide decks will be posted online before every class, and lectures will be taped and posted afterwards using this platform.

### 3.2 Recommended Resources

#### Undergraduate Calendar (Website)

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/>

Undergraduate Calendar is the source of information about the University of Guelph's procedures, policies and regulations, which apply to undergraduate programs. Link provided.

### 3.3 TEXTBOOK AND READINGS

There is no required text for this class. Background readings (e.g. review articles from the scientific literature) will be provided as PDF files on the course website or discussed in class. Students are responsible for any additional background reading they think is necessary, however instructors can provide suggestions of reading material if requested. For the Research Presentation and Research Paper, students are expected to search and read current scientific literature, including original research papers, relevant to their topic. Instructors can provide groups with a short list of recommended readings once student groups and topics have been assigned.

### 3.3 Campus Resources

If you are concerned about any aspect of your academic program:

- make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counselling](#)

If you are struggling to succeed academically:

- There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist. [The Learning Commons](#)

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. [Counselling Services](#)
- Student Health Services is located on campus and is available to provide medical attention. [Student Health Services](#)
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. [Stress Management and High Performance Clinic](#)

If you have a documented disability or think you may have a disability:

- The Centre for Students with Disabilities (CSD) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see: [Centre for Students with Disabilities](#)

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## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

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

1. Have an understanding of the importance of genetics for elite performance.

2. Have a thorough appreciation of exercise physiology, with a particular emphasis on skeletal muscle.
3. Have an extensive understanding of the current state of knowledge regarding how exercise training affects gene regulation.
4. Have an understanding of mechanisms thought to cause various diseases from a genetic perspective.
5. Understand how exercise combats many diseases at the molecular level in muscle.
6. Critically evaluate scientific reports.
7. Have improved small group work and self-directed learning skills.
8. Successfully work in small groups.
9. Have improved scientific writing and oral presentation skills.

## 4.2 Course Goal

The objective of this course is to expand on the introductory laboratory practices developed previously in 'Lifestyle Genomics'. While 'Lifestyle Genomics', the prerequisite to this course, focused on the basic understanding of how lifestyle choices (ie. diet and exercise) interact to effect health, the current course represents an in depth examination of how exercise 1) effects gene transcription to influence elite performance (ie. training for sport) and 2) can be used as a therapeutic strategy to influence the expression of specific genes to recover health of an individual (ie. exercising for health). The students will be introduced to the underlying concepts of various molecular processes in lecture, and strengthened through journal club discussions and a critical evaluation of the scientific literature (presentation and paper). This course therefore represents a unique opportunity to merge many facets of your previous University training, including molecular biology, physiology, cell biology and lifestyle genomics, to understand the beneficial effects of exercise at the genetic level. To apply this knowledge to various pathologies, a general understanding of the mechanisms causing specific diseases will also be explored. The goal for this course is to ensure that the student will emerge with a greater understanding of exercise training at the molecular level, as well as fully appreciate the notion of the 'specificity of training', as different training regimes will be discussed in the context of genetic adaptations. To achieve this, students will explore the potential for genetics to be a prerequisite for elite performance and how training in elite athletes can improve performance by altering the expression of specific genes. In addition, students will explore the genetics for disease (examples include obesity, insulin resistance, type 2 diabetes, heart failure) and how exercise can recover health of the individual by altering the expression of specific genes.

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## 5 Teaching and Learning Activities

### 5.1 Course Teaching / Learning Approach

The course comprises a combination of lectures, journal club discussion and small group presentations. This course will consist of 10 weeks of lectures (2 online lectures per week, each lasting 1.5 hours) and 2 weeks of student presentations. Lectures will consist of

'classical didactic' lectures and interactive journal club discussions of key research papers. The journal club discussions are aimed at strengthening the students understanding of key concepts, while also improving their critical thinking/ability to critique primary science articles, skills necessary to succeed with their independent research projects. Students will submit an independent paper on October 26th with the goal of integrating feedback from the instructor for their group presentation, which will be posted online November 25th (taped group presentations). Students will choose 3 presentations to watch and provide constructive feedback for their peers, and have the opportunity to reflect on their strengths, weaknesses and growth throughout the semester. An overview of the course content will be provided on the course website before lectures, accessible via D2L (web link indicated below). However, students should be aware that these notes will be provided primarily as a structural draft for the lectures. For students to acquire the necessary information to succeed in this course they will be required to watch/participate in all lectures (either face-to-face or live streaming). In addition, review papers from the current scientific literature will provide background reading for the lectures and will be made available as PDFs on the course website. Students are expected to read all papers and any additional background reading they think is necessary.

It is expected that once Research Presentation groups are established students arrange meetings outside of class time in which to organize and plan their presentations. Students are given a minimum of 8 weeks to prepare for their presentation. You can contact the instructor by email if you have any questions pertaining to the presentation. It is highly encouraged that groups meet weekly in an online forum to discuss progress and to interact for their presentation. Meeting on a regular basis will be evident in the quality of the final presentation. Note that content presented in the Research Presentations can be included in the final exam. This will be an invaluable opportunity for small group discussion and interaction and is critical to achieving the learner-centered objective of this course as outlined above.

The key concepts and theory underlying each concept will be presented in a series of lectures and strengthened by evaluating key research papers. The lecture material, and any supplementing research papers, will be posted on D2L.

Please read the journal club papers before coming to class.

## **5.2 ATTENDANCE EXPECTATIONS**

Since lecture and Research Presentation content will be assessed in the final exam, it is strongly encouraged that students attend all lectures (face-to-face or live streaming). The structural overview of lectures will be made available on the website, including taped lectures, however students who have missed classes are encouraged to interact with their fellow students to obtain any additional material, or appointments can be made to discuss course content with the instructors.

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# **6 Assessments**

## **6.1 Assessments**

<b>Form of Assessment</b>	<b>Weight (% final grade)</b>	<b>Learning Outcomes</b>
Midterm (Oct. 14th, online during class hours)	20%	1-3, 6
Final Exam (TBD)	30%	3-6
Research Paper (Oct. 26th-start of class)	20 or 30%	6-9
Research Presentation (Submitted November 25th)	20 or 30%	6-9

## 6.2 Note

Note: The better mark between the research paper and presentation will count for 30%, while the lower grade will comprise 20% of the students' final grade.

MIDTERM EXAM: The midterm exam will assess the students understanding on the material presented prior to the exam date. The midterm will be in class on October 14th.

FINAL EXAM: The final exam will assess the students understanding of course content and their ability to integrate and apply the various concepts presented during this course. This will compose 30% of the final grade.

Please note, exams and papers are independent assessments, and the instructor will be using platforms to look for plagiarism. Should plagiarism be detected you will receive zero for that assessment.

RESEARCH PRESENTATION AND RESEARCH PAPER: The Research Presentation and Research Paper, when combined will comprise 50% of the final grade. The better mark (of the two assignments) will account for 30% of a student's final grade and the lower mark will account for the remaining 20%.

Presentation topics will be selected by students, and incorporate both exercise and genetics. Topics must be verified as acceptable by the course instructor. It is expected that topics relate to the general focus of the course, but do not need to be focussed on skeletal muscle, as this is your chance to apply your knowledge in a broader context. Student groups will be required to use journal articles, books, etc to further develop each topic. Groups will consist of 3-4 students.

Historical topics that students have chosen include: exercise as treatment/prevention for cancer, sex differences in fat oxidation during exercise, exercise in the management of anxiety/depression or Alzheimer's, exercise in the management of Parkinson's or Multiple Sclerosis, exercise for the prevention of heart disease and/or atherosclerosis, exercise and Marfan's syndrome. Please note this is not a complete list of possibilities, and is simply provided for guidance.

**Research Paper:** Each student will be required to prepare and submit an independent Research Paper related to the groups research topic . The final Research Paper must not be longer than 8 typed pages (double spaced, 12 point Times font, ¾ inch margins), not including figures, tables, and references. The Research Paper will be submitted online before the start of class on October 26th. A late penalty of 10% will be deducted for each day the paper is late (starting at 10:01 when lecture commences), with a maximal deduction of 100% after 10 days.

**Notes:** Students will submit a short 1 page summary/abstract of their planned topic/research direction on September 28th to be graded. This will provide 5% of the final grade of the research paper, ensure students start working on the research topics early, and also provide the opportunity for constructive feedback from the instructor before becoming heavily invested in the research project.

**Reflection:** Students will submit a 1 page personal reflection statement on October 26th addressing their perceived strengths, weaknesses and different strategies to implement in the future to maximize success in the context of an independent research paper. This document will provide 5% of the final grade of their research paper.

**Research Presentation:** A taped group presentation, 15-25 minutes in length, will be submitted on November 25th. It is obligatory that each student in the group present material related to the topic during the presentation. Please note, it is expected that groups will only meet in a virtual space, and work together to amalgamate the information contained within each students research paper to present a clear message for the audience.

**Note:** Each presentation will be posted online, and students will be required to provide constructive feedback on 3 of the posted presentations. This feedback will be submitted to the instructor, and count as 5% towards the final presentation grade.

**Reflection:** Each group member will submit a 1 page personal reflection statement on November 25th addressing their individual strengths, weaknesses and different approaches to implement in the future to maximize success within a small group dynamic. This document will provide 5% of the final grade of their research presentation.

Each group member will also submit a reflection statement on November 25th addressing their group members strengths and weaknesses, as well as a grade out of 5 for each group member. This grade will be averaged across all group members to provide 5% of the final grade for each group members presentation.

## 7 Course Statements

### 7.1 Grading

If you are absent from classes during the semester, you will be expected to make up missed lecture material on your own by watching the posted taped lecture. Assignments handed in late will be penalized 10% for every day that it is late.

## 8 Department of Human Health and Nutritional Sciences Statements

### 8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

### 8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist. <http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

### 8.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. <https://www.uoguelph.ca/counselling/>

- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.selfregulationskills.ca/>

## 8.4 Personal information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) <http://www.e-laws.gov.on.ca/index.html>. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes.

For more information regarding the Collection, Use and Disclosure of Personal Information policies please see the Undergraduate Calendar. (<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml>)

## 8.5 Course Offering Information Disclaimer

Please note that course delivery format (face-to-face vs online) is subject to change up to the first-class day depending on requirements placed on the University and its employees by public health bodies, and local, provincial and federal governments. Any changes to course format prior to the first class will be posted on WebAdvisor/Student Planning as they become available.

# 9 University Statements

## 9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

## 9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals  
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration  
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions  
<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

### 9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses  
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes  
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses  
<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

### 9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

### 9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website  
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website  
<https://www.ridgetownc.com/services/accessibilityservices.cfm>

## 9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

## 9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## 9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>

## 9.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

## 9.10 Illness

The University will not normally require verification of illness (doctor's notes) for fall 2020 or winter 2021 semester courses. However, requests for Academic Consideration may still require medical documentation as appropriate.

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