



ANSC*6390 QTL and Genetic Markers

Winter 2023

Section(s): C01

Department of Animal Biosciences

Credit Weight: 0.50

Version 1.00 - January 10, 2023

1 Course Details

1.1 Calendar Description

Advanced training in QTL mapping and selection assisted by genetic markers.

1.2 Course Description

This graduate course is intended to teach statistical models and methods used in the detection of Quantitative Trait Loci (QTL) and selection assisted by genetic markers in livestock.

1.3 Timetable

Mondays and Wednesdays from 1:00 to 2:20 pm. In person lectures in the room ANNU 030.

1.4 Final Exam

The final exam will be a take home final comprehensive assignment.

2 Instructional Support

2.1 Instructional Support Team

Instructor:	Flavio Schenkel
Email:	schenkel@uoguelph.ca
Telephone:	+1-519-824-4120 x58650
Office:	ANNU 121
Office Hours:	Office hours: Wednesdays from 2:20-2:50 pm in room ANNU

121.

2.2 Netiquette Expectations

Inappropriate online behaviour will not be tolerated. Examples of inappropriate online behaviour include:

- Posting inflammatory messages about your instructor or fellow students

- Using obscene or offensive language online

- Copying or presenting someone else's work as your own

- Adapting information from the Internet without using proper citations or references

- Buying or selling term papers or assignments

- Posting or selling course materials to course notes websites

- Having someone else complete your quiz or completing a quiz for/with another student

- Stating false claims about lost quiz answers or other assignment submissions

- Threatening or harassing a student or instructor online

- Discriminating against fellow students, instructors and/or TAs

- Using the course website to promote profit-driven products or services

- Attempting to compromise the security or functionality of the learning management

system

- Sharing your user name and password
 - Recording lectures without the permission of the instructor
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3 Learning Resources

3.1 Additional Resources

Other Resources (Other)

Course notes from Dr. Ben Hayes (“Gene detection and marker assisted selection: Putting the theory into practice”) and Dr. Lawrence Schaeffer (“ANSC*6390 Quantitative Genetics”) will be used during the course (both available in the course’s webpage).

Extra pertinent information, such as papers, chapters of books, etc. will be accordingly recommended.

Students are advised to take their own notes during lectures.

3.2 Course Technology and Technical Support

This course will use a variety of technologies including;

- CourseLink (main classroom)
- Zoom (see comments on Zoom below)

To help ensure you have the best learning experience possible, please review the list of system and software requirements.

<https://opened.uoguelph.ca/student-resources/system-and-software-requirements>

CourseLink System Requirements

You are responsible for ensuring that your computer system meets the necessary system requirements. Use the browser check tool to ensure your browser settings are compatible and up to date. (Results will be displayed in a new browser window).

<http://spaces.uoguelph.ca/ed/system-requirements/>
<https://courselink.uoguelph.ca/d2l/systemCheck>

CourseLink

This course is being offered using CourseLink (powered by D2L's Brightspace), the University of Guelph's online learning management system (LMS). By using this service, you agree to comply with the University of Guelph's Access and Privacy Guidelines. Please visit the D2L website to review the Brightspace privacy statement and Brightspace Learning Environment web accessibility standards.

<http://www.uoguelph.ca/web/privacy/> <https://www.d2l.com/legal/privacy/>
<https://www.d2l.com/accessibility/standards/>

Technical Support

If you need any assistance with the software tools or the CourseLink website, contact CourseLink Support.

Email: courselink@uoguelph.ca

Tel: 519-824-4120 ext. 56939 Toll-Free (CAN/USA): 1-866-275-1478

Support Hours (Eastern Time):

Monday thru Friday: 8:30 am–8:30 pm

Saturday: 10:00 am–4:00 pm

Sunday: 12:00 pm–6:00 pm

Zoom

This course will use Zoom for delivering lectures ONLY for those who are sick with a transmittable disease, such as Covid 19 and Influenza. Check your system requirements to ensure you will be able to participate if needed.

<https://opened.uoguelph.ca/student-resources/system-and-software-requirements>

3.2 Technical Skills

As part of your learning experience, you are expected to use a variety of technologies for assignments, lectures, teamwork, and meetings. In order to be successful in this course you will need to have the following technical skills:

- Manage files and folders on your computer (e.g., save, name, copy, backup, rename, delete, and check properties);
- Install software, security, and virus protection;
- Use office applications (e.g., Word, PowerPoint, Excel, or similar) to create documents;
- Be comfortable uploading and downloading saved files;
- Communicate using email (e.g., create, receive, reply, print, send, download, and open attachments);

- Navigate the CourseLink learning environment and use the essential tools, such as Dropbox, Quizzes, Discussions, and Grades (the instructions for this are given in your course);
- Access, navigate, and search the Internet using a web browser (e.g., Firefox, Internet Explorer); and
- Perform online research using various search engines (e.g., Google) and library databases.

3.2 Library Access

As a student, you have access to the University of Guelph's library collection, including both physical and electronic materials. For information on checking out or couriering physical library items, accessing electronic journals and returning items to the library, visit the library's website.

If you are studying off campus and would like to access the library's electronic resources, use the Off Campus Login and login using your Single Sign On credentials or using your last name and library barcode.

<https://www.lib.uoguelph.ca/>

<https://www.lib.uoguelph.ca/campus-login>

4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Integrate quantitative genetics, genetic markers and statistics to detect and map QTL and hunt for candidate genes.
2. Perform and understand data analyses for detecting and mapping QTL in livestock.
3. Appreciate differences among mapping designs and mapping methods.
4. Integrate knowledge of quantitative genetics and mapping techniques and evaluate how the results from these techniques are applied to breeding programs.

5. Discuss the relative merits of methods and designs used for mapping QTL.
 6. Optimize QTL detection and mapping to maximize power and genetic variance accounted for the genetic markers.
 7. Accurately and effectively communicate scientific analyses in written form.
 8. Have a proficient command terminology common in QTL mapping, selection assisted by genetic markers and genomics.
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5 Teaching and Learning Activities

5.1 Lecture

Topics: Course Content

This graduate course will teach statistical models and methods used in the detection of Quantitative Trait Loci (QTL) and selection assisted by genetic markers in livestock. By the end of the course, a student will be able to use quantitative genetics, genetic marker information, and statistics to map QTL and describe factors that affect mapping and how QTL can be exploited in selection assisted by genetic markers.

Topics: Lecture Content

Block 1

Review of Mendelian, Population, and Quantitative Genetics. Foundations of linkage mapping.

Block 2

Different designs of linkage mapping experiments.

Block 3

Linkage and linkage disequilibrium (LD) mapping.

Block 4

Bioinformatics tools to hunt for causative mutations.

Block 5

Selection assisted by linked, LD and direct markers, and genomic selection.

6 Assessments

6.1 Marking Schemes & Distributions

The 9 assignments during the semester will have a percentage weight of 34% (3.78% each) of

the final grade and the midterm and final exams will have a percentage weight of 33% each.

Name	Scheme A (%)
Assignment 1	3.78
Assignment 2	3.78
Assignment 3	3.78
Assignment 4	3.78
Assignment 5	3.78
Assignment 6	3.78
Assignment 7	3.78
Assignment 8	3.77
Assignment 9	3.77
Final Exam	33
Midterm Exam	33
Total	100

6.2 Assessment Details

Assignment 1 (3.78%)

Due: Wed, Jan 25, 5:30 PM

Learning Outcome: 1

Assignment 2 (3.78%)

Due: Wed, Feb 1, 05:30 PM

Learning Outcome: 1

Assignment 3 (3.78%)

Due: Wed, Feb 8, 5:30 PM

Learning Outcome: 1

Assignment 4 (3.78%)

Due: Wed, Feb 15, 5:30 PM

Learning Outcome: 1, 2

Assignment 5 (3.78%)

Due: Wed, Mar 8, 5:30 PM

Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8

Assignment 6 (3.78%)

Due: Wed, Mar 15, 5:30 PM

Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8

Assignment 7 (3.78%)

Due: Wed, Mar 22, 5:30 PM

Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8

Assignment 8 (3.77%)

Due: Wed, Mar 29, 5:30 PM

Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8

Assignment 9 (3.77%)

Date: Wed, Apr 5, 5:30 PM

Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8

Final Exam (33%)

Date: Sat, Apr 22, 5:30 PM

The final exam is a take home assignment.

Midterm Exam (33%)

Date: Mon, Feb 27, 1:00 PM - 2:20 PM

In class, closed book exam.

7 Course Statements

7.1 Grading Policies

All assignments (including the take home final exam) must be submitted by 5:30 pm of the due date. Late assignments will be penalized as follows:

1 day late – 25% penalty (i.e. discount) applied to the obtained grade

2 days late – 50% penalty applied to the obtained grade

3 days late – 75% penalty applied to the obtained grade

>3 days late – 100% penalty applied to the obtained grade

7.2 Dropbox Submissions

Assignments should be submitted electronically via the online **Dropbox** tool. When submitting your assignments using the **Dropbox** tool, do not leave the page until your assignment has successfully uploaded. To verify that your submission was complete, you can view the submission history immediately after the upload to see which files uploaded successfully. The system will also email you a receipt. Save this email receipt as proof of submission.

Be sure to keep a back-up copy of all of your assignments in the event that they are lost in transition. In order to avoid any last-minute computer problems, your instructor strongly recommend you save your assignments to a cloud-based file storage (e.g., OneDrive), or send

to your email account, so that should something happen to your computer, the assignment could still be submitted on time or re-submitted.

It is your responsibility to submit your assignments on time as specified on the Schedule. Be sure to check the technical requirements and make sure you have the proper computer, that you have a supported browser, and that you have reliable Internet access. Remember that **technical difficulty is not an excuse not to turn in your assignment on time**. Don't wait until the last minute as you may get behind in your work.

If, for some reason, you have a technical difficulty when submitting your assignment electronically, please contact your instructor or CourseLink Support.

<http://spaces.uoguelph.ca/ed/contact-us/>

8 University Statements

8.1 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.

8.2 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>

8.3 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>

8.4 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.

8.5 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 make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

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>

8.6 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>

8.7 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.

8.8 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>

8.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

8.10 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major

assignment).

8.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campus/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campus/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.
