



## Syllabus – BIOL 226 – Genes to Genomes

COURSE TITLE:	<b>BIOL 226, Genetics from Genes to Genomes</b>		
COURSE CODE:	<b>CRN 82713</b>	TERM:	<b>T1 (Fall 2018)</b>
COURSE CREDITS:	<b>3.0</b>	DELIVERY:	<b>3L – 3P</b>
CLASS SECTION:	<b>01</b>		
START DATE:	<b>Sept. 5 (note 1<sup>st</sup> lab is Sept. 17 – 21)</b>		
LECTURE LOCATION:	<b>Biology Building, Room 106</b>		
LECTURE TIME:	<b>MWF 10:30 am – 11:20 am</b>		
LAB LOCATION:	<b>Thorvaldson G77</b>		
LAB TIME:	<b>Varies by lab section</b>		
WEBSITE:	<b>via Blackboard</b>		

### Course Description

This course combines classical genetics with modern molecular analysis. The first half of the course focuses on Mendelian genetics as we relate it to the chromosomal theory of inheritance. This is followed by the study of genetic linkage, genetic recombination, and genetic mapping. In the second half, we turn to understand the fundamental molecular processes (transcription and translation) that control the flow of information from the genome to yield variation at the level of the phenotype. We finish by looking at how our understanding of genetics and its uses have changed with the advent of recombinant DNA technology. This course is an introduction of the basic genetics concepts that permeate other fields in the biological sciences.

### Prerequisites

BIOL 120.

Note: BIOL 121 is strongly recommended. Students with credit for BIOL 211 will not receive credit for BIOL 226.

## Learning Outcomes

By the completion of this course, students will have a sound basic understanding of the principles of Mendelian and molecular genetics.

The student will:

1. be able to interpret and analyse genetic experiments,
2. understand how classical genetics relates to chromosome behaviour,
3. understand recombination and be able to map chromosomes,
4. understand the organisation of eukaryotic and prokaryotic genomes,
5. recognize how expression of genetic information is related to phenotype, and
6. understand gene expression and regulation mechanisms.

**Note:** The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at:

[http://www.usask.ca/university\\_secretary/LearningCharter.pdf](http://www.usask.ca/university_secretary/LearningCharter.pdf)

## Course Overview

This course is intended for students who want to explore genetics in greater depth. Lectures are 50 minutes each, for a total of 36 lectures, plus one in-class midterm exam held on **Oct. 17**.

Laboratories will be divided into an introduction, protocol explanation and experiment parts. At the end of each experiment, a discussion will take place considering the data generated in the class. A laboratory exam will be administered. More details will be made available in the first laboratory section.

## Resources

**Lab manual (required):** Each student is required to purchase an access code from the U of S campus book store for downloading the lab book <https://artsandscience.usask.ca/ebook>. The access code can be purchased for \$25.

**Suggested textbook:**

*Introduction to Genetic Analysis* – 11<sup>th</sup> edition. Griffiths et al., 2015.

Support text:

*Principles of Genetics* – 6th Edition. Snustad and Simmons, 2012.  
The Natural Sciences Library will have copies of these textbooks.

**Interactive quizzes:**

**Sapling® (saplinglearning.com) (required):** It is required that students acquire a license to use Sapling® (saplinglearning.com) with their textbook or online separately. You are not required to purchase the textbook, but you must acquire a Sapling® license to take the assignments.

## Recording of Lectures

Lecture capture has been activated so that videos of the lectures will be available to students on the Blackboard website (hopefully, barring technical difficulties).

Video recording of classes by students is not allowed.

## Lecture Topics

Part 1: Transmission genetics

- Introduction to genetics
- Inheritance of simple traits
- Chromosomes
- Linkage, recombination, and mapping
- Gene interactions and complex traits

Part 2: Molecular genetics, from DNA to phenotype

- Bacterial and viral genetics
- From DNA to RNA to protein
- Control of gene expression
- DNA technology

Part 3: Variation and evolution

- Genetic drift and natural selection

## Lab Activities

In the lab, students will perform:

- 1) controlled crosses of fruit fly strains,
- 2) chromatography and PCR assays, and
- 3) problem sets to illustrate the concepts behind the experiments.

## Lab Schedule

Date	Week	Lab	Lab Exercise	Key points
Sept. 17 – 21	1	1	Introduction. Set up <i>Drosophila</i> breeding experiment: Main Cross (four genes)	<i>Drosophila</i> cross set up
Sept. 24 – 28	2	2	<i>Drosophila</i> experiment: cross category # 2. Sex linkage	Understanding a dihybrid cross
Oct. 1 – 5	3	3	<i>Drosophila</i> experiment: cross category # 3. Linkage and gene mapping. Set up F1 X F1 cross	F1 flies are emerging: scoring
Oct. 8 – 12	4		Thanksgiving day. No sessions this week	
Oct. 15 – 19	5	4	Thin layer chromatography of <i>Drosophila</i> eye pigments. Score F2 progeny	F2 flies are emerging: scoring
Oct. 22 – 26	6	5	Chi-square ( $\chi^2$ ) test: a statistical test for experiments (F1 <i>Drosophila</i> data analysis). Score F2 progeny	F2 flies are emerging: scoring
Oct. 29 Nov. 2	7	6	Mendelian genetics: general remarks and <i>Drosophila</i> class data discussion	Use of class data for testing hypothesis and gene mapping
Nov. 5 – 9	8	7	PCR genotyping of <i>Drosophila</i> mutants and gel electrophoresis of DNA fragments	Molecular genetics: Understanding the white mutation
Nov. 12 – 16	9		Reading week: review your lab manual and material posted online	
Nov. 19 – 23	10	8	Review session	Lab evaluation, solving exam-type exercises
Nov. 26 – 30	11		Lab exam	Worth 25% of the BIOL226 course

## Instructors

Lecture: Daniel Schott

office: TBA

email: [daniel.schott@usask.ca](mailto:daniel.schott@usask.ca)

email will be the most reliable way of contacting me. On weekdays I'll try to respond within 24 hours; On weekends I might not get to email until Monday.

I'll be happy to hold office hours, by email appointment.

Lab: Andres Posso-Terranova

office: room G77 Thorvaldson

email: [andres.posso@usask.ca](mailto:andres.posso@usask.ca)

phone: 966-4431

## Evaluation of Student Performance

Midterm exam	20
Final exam	40
Lab	30
Questions throughout term	10
Total	100%

Midterm and final exam questions will be based on the material presented and discussed in the lectures and homework assignments. Use the suggested textbooks as reference for context when studying.

**Midterm Exam:** 20% of final course grade. Date: October 17th, in class. Length: 45 minutes. Format: 25 multiple choice questions. No phones, laptops, tablets, or other aids allowed, except a nonprogrammable calculator.

**Final Exam:** 40% of final grade. Date: To be announced by the university registrar. Consult the Final Exam Schedule. Length: 3 hours Format: 70 multiple choice questions. The exam is comprehensive in that it will cover all lecture material. No phones, laptops, tablets, or other aids allowed, except a nonprogrammable calculator.

Final examinations may be scheduled at any time during the examination period (December 8 – 22); students should therefore avoid making prior travel, employment, or other commitments for this period.

**Lab Component:** 30% Final of final course grade. Lab Exam: accounts for 25%, and weekly lab assignments for 5%. For due dates,

see Lab schedule above. The final lab exam consists of 50 multiple choice questions. For more information, please attend the first laboratory section of the course.

**Sapling homework assignments:** 5% of final grade. Date: Out-of-class online question assignments at various times during the term, to be announced in lecture. Full completion of the exercises will grant full marks for the assignment, irrespective of the score (correct answers). More details about how to use Sapling will be given during the lectures.

**Top Hat responses in class, and supplementary online questions:** 5% of final grade. Date: Throughout the term. Completion of at least 75% of the questions will grant full marks, irrespective of the score (correct answers).

There are no minimal marks required in these individual components in order to successfully pass the course.

### Required Components and Exam Scheduling

**Student MUST complete all laboratory exercises and take the lab exam to pass the course.** There is no minimum lab mark requirement. In case the laboratory requirement is not met, the final course mark will be a fail irrespective of performance in midterm and final exams. Students are expected to attend all scheduled laboratory practices. No make up labs will be offered. **The lab exam, midterm and final examinations must be written on the date scheduled.** Failure to take any exam(s) will result in a mark of 0 (zero) for the correspondent exam(s). Final course examinations may be scheduled at any time during the examination period; students should therefore avoid making prior travel, employment, or other commitments for this period. If a student is unable to write a midterm or the lab exam through no fault of his or her own, for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam *may* be given. **Students who miss the final exam must contact the College and apply for a deferred final exam.** Deferred exams are scheduled by the undergraduate office and may use a different format than the regular exam, at the sole discretion of the instructor. Students are encouraged to review all University examination policies and procedures:

<http://www.usask.ca/calendar/exams&grades/examregs/>

### University of Saskatchewan Grading System

Students in BIOL 226 are reminded that the University has established a grading system to be used in all of its courses. A description of grading at the University of Saskatchewan can be found at:

<http://students.usask.ca/academics/grading/grading-system.php>

There are different literal descriptors for undergraduate and graduate students.

More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

<http://policies.usask.ca/policies/academic-affairs/academic-courses.php>

### Attendance Expectations

Students are required to attend **all scheduled labs**. *No make up labs will be offered.*

Students are expected to attend as many of the lectures as they able.

### Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (<http://www.usask.ca/secretariat/student-conduct-appeals/StudentAcademicMisconduct.pdf>) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (<http://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.pdf>)

For more information on what academic integrity means for students see the Student Conduct & Appeals section of the University Secretary Website at:

<http://www.usask.ca/secretariat/student-conduct-appeals/forms/IntegrityDefined.pdf>

### Examinations with Access and Equity Services (AES)

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals.

In order to access AES programs and supports, students must follow AES policy and procedures. For more information, check [www.students.usask.ca/aes](http://www.students.usask.ca/aes)

or contact AES at 306-966-7273 or [aes@usask.ca](mailto:aes@usask.ca).

Students registered with AES may request alternative arrangements for mid-term and final examinations.

Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

## Student Supports

### Student Learning Services

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site <http://library.usask.ca/studentlearning/>.

### Student and Enrolment Services Division

The Student and Enrolment Services Division (SESD) focuses on providing developmental and support services and programs to students and the university community. For more information, see the students' web site <http://students.usask.ca>.

### Financial Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact Student Central (<https://students.usask.ca/student-central.php>).

### Aboriginal Students Centre

The Aboriginal Students Centre (ASC) is dedicated to supporting Aboriginal student academic and personal success. The centre offers personal, social, cultural and some academic supports to Métis, First Nations, and Inuit students. The centre is also dedicated to intercultural education, bringing Aboriginal and non-Aboriginal students together to learn from, with and about one another in a respectful, inclusive and safe environment. Students are encouraged to visit the ASC's Facebook page (<https://www.facebook.com/aboriginalstudentscentre/>) to learn more.



### International Student and Study Abroad Centre

The International Student and Study Abroad Centre (ISSAC) supports student success in their international education experiences at the U of S and abroad. ISSAC is here to assist all international undergraduate, graduate, exchange and English as a Second Language students and their families in their transition to the U of S and Saskatoon. ISSAC offers advising and support on all matters that affect international students and their families and on all matters related to studying abroad. Please visit [students.usask.ca](http://students.usask.ca) for more information.

### Land Acknowledgement

As we gather here today, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another. We recognize that in the course of your studies you will spend time learning in other traditional territories and Métis homelands. We wish you safe, productive and respectful encounters in these places.

### Other Acknowledgements

**Many thanks to the previous BIOL226 instructors, on whose syllabi this one is based.**