

Molecular Genetics of Eukaryotes – Course Syllabus

COURSE TITLE:	Molecular Genetics of Eukaryotes		
COURSE CODE:	BIOL 316.3	TERM:	T1 (fall 2014)
COURSE CREDITS:	3.0	DELIVERY:	3L-3P
CLASS SECTION:	01	START DATE:	September 3
CLASS LOCATION:	Room 125, Biology Building		
CLASS TIME:	MWF 10:30 am - 11:20 am		
WEBSITE:	via Blackboard		
LAB LOCATION:	Room 213, Biology Building		
LAB TIME:	W 1:30 pm - 4:20 pm (note 1 st lab meeting is Sept. 10)		

Course Description

Examines advanced topics in molecular genetics of eukaryotes. Examples of topics covered include epigenetics, RNA interference or post-transcriptional gene silencing, the role of model organisms in scientific research, organelle genetics, and RNA splicing. The lab will involve a combination of hands-on experimentation, computer-based analysis and student presentations.

Prerequisite: BIOL 226 (formerly BIOL 211).

Learning Outcomes

By the completion of this course, students will be expected to:

1. Understand the basic strategies of genetic analysis at the gene and genome level.
2. Understand the diversity of model organisms and their specific uses in genetics research.
3. Be able to read, understand, summarize and present a scientific article.
4. Identify a scientific problem and devise an experimental approach to address it.

Course Overview

This course is intended for students who want to explore the current trends in genetics research and understand how the new technologies involved are transforming the world we live in. Students will already have been introduced to basic genetics and molecular biology concepts in BIOL 226 (formerly BIOL 211).

The course is taught from a researcher's perspective and the experimental viewpoint is emphasized. By the end of the course, students are expected to understand how to apply the scientific method to answer basic biological questions using the existing genetic tools. We will discuss gene-specific and genomic approaches. In the process, students will learn to appreciate the importance of model organisms as platforms to study conserved or universal mechanisms in biology.

The course will have a lecture, laboratory and student seminar modules. The seminars will be an opportunity for students to showcase different model organisms used in genetic analysis and explore their impact in research.

Evaluation will be based mostly on two exams, four lab reports and the individual seminar. A small part of the grade will be based on short in-lecture quizzes and class participation. There are no mandatory components or attendance required for passing the course, but attendance is strongly recommended.

Lecture Topics

Topic 1: Fundamentals of eukaryotic genes
(Watson *et al.* 2007 chapters 5 and 7)

Topic 2: Gene level analysis I: Mutant isolation and gene mapping strategies
(Watson *et al.* 2007 chapter 12)

Topic 3: Gene level analysis II: Genetic transformation and gene-specific knockouts
(Watson *et al.* 2007 chapter 6)

Topic 4: Genome level analysis and high throughput strategies
(Watson *et al.* 2007 chapters 10, 11, 12, 13 and 14)

Topic 5: Epigenetics, mosaicism and regulation of gene dosage
(Watson *et al.* 2007 chapter 8)

Topic 6: RNA interference and post-transcriptional gene silencing
(Watson *et al.* 2007 chapter 9)

Topic 7: DNA fingerprinting and molecular forensics
(Watson *et al.* 2007 chapter 16)

Laboratory Exercises

A detailed schedule of laboratory exercises will be provided in the first week of classes.

- (1) Mutagenesis and complementation in yeast (*Saccharomyces cerevisiae*)
- (2) Heat shock-induced expression in fruit flies (*Drosophila melanogaster*)
- (3) Chemotaxis in worms (*Caenorhabditis elegans*)
- (4) RNA interference in worms (*Caenorhabditis elegans*)

Suggested Resources

Text Book: Most lectures will be loosely based on chapters of the Watson textbook listed below. Purchase of the textbook is not required. If you have plans to take further courses in genetics/molecular biology during your undergraduate program or are considering applying to graduate school in these fields, purchasing this textbook will be beneficial to you after this course. Otherwise, two copies are on reserve in the Natural Sciences Library (Geology Library) for this course.

Recombinant DNA: Genes and Genomes – A Short Course, 3rd Edition (paperback). Watson, Caudy, Myers and Witkowski. 2007.

Textbooks are available from the University of Saskatchewan Bookstore:
www.usask.ca/consumer_services/bookstore/textbooks

Website: Lecture notes, laboratory files, etc., will be posted on Blackboard (Paws).

Evaluation, at-a-glance:

		dates:
In-class quizzes, and course participation	5%	Quizzes in lecture, most Wednesdays
Lab Reports (4)	15%	TBA. In lab, soon after each module
Mid Term Exam	20%	Fri., October 17 th 10:30 - 11:20 am
Seminar	20%	TBA. Last half of course
Final Exam	40%	TBA. December 6 to December 23

Grading System

Information on literal descriptors for grading at the University of Saskatchewan can be found at: <http://students.usask.ca/academics/grading/grading-system.php#GradingSystem>

Evaluation, in Detail:

Seminars:

The seminar is a very important component of this course, and will account for **20%** of the final marks. The student does a 20-25 minute presentation on front of class based on a primary research article, and additionally prepares short handout on the experimental system described.

The purpose of the seminar is to give the student the opportunity to broaden his or her knowledge of a particular eukaryotic model organism that he or she is interested. Ultimately, the goal of this part of the course is to demonstrate how genetic research takes advantage of the existing biological diversity to establish research models that are suitable in addressing specific research questions. Grading will be based on the clarity of the student's presentation and the student's understanding of the paper. There will be no make up seminars. If there is a justifiable reason a student absolutely cannot present the seminar (e.g. serious illness or a family emergency), the final exam for that student will count for **60%** of the final grade instead of **40%**.

Lab Reports:

Lab reports are intended to demonstrate that you have performed and understood the experiment and can translate the data into simple, direct and precise scientific language. Lab reports are not meant to reproduce the content of lectures but to sharpen the student's ability to recognize and sort out relevant data that addresses a particular experimental question towards a reasonable conclusion. An explanation of the format of lab reports will be given in the first lab session. Late reports will receive a grade of 0%. Do not turn in a lab report if you have not attended the lab. There will be no make up labs. Finally, make sure you have understood the labs as they will be included in the exams. Lab reports will amount to **15%** of the marks.

Short Quizzes, and Class Participation:

The quizzes will take place during Wednesday lectures, and will consist of ~3 multiple choice, short answer, or one-sentence answer questions, and will cover similar material to the mid term and final exams (see below). Not all Wednesday lectures will have a quiz. At the instructor's discretion, a bonus of up to 2% will be added to the final quiz grade if the student has shown exceptionally good participation in class discussions. The short quiz grades and any class participation bonus will amount to **5%** of the course marks.

Mid Term Exam:

The midterm exam will take place in class on October 17, and will account for **20%** of the student final marks and will cover all lectures and all laboratories to that point. It will be

composed of multiple choice questions, short answer questions, and a couple of short (one paragraph) essay questions.

Final Exam:

The final exam will be comprehensive in nature and consist of essay-style, short answer, and multiple choice questions to be answered in 3 hours. The time and date of the final exam will be set by the registrar's office of the University of Saskatchewan. The exam will account for **40%** of the student final mark and will encompass the lectures, the labs, and all seminars presented.

Note on midterm and final examination scheduling: Midterm and final examinations must be written on the date scheduled.

Final examinations may be scheduled at any time during the examination period (December 6 to December 23); students should therefore avoid making prior travel, employment, or other commitments for this period. If a student is unable to write an 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 are encouraged to review all examination policies and procedures:

<http://students.usask.ca/academics/exams.php>

Instructor Information

Instructor: **Daniel Schott**

Office: room 151 BIOL Building

Ph# Office phone TBA; Skype and/or cell phone on request.

email: daniel.schott@usask.ca

My email will be the most reliable way of contacting me.

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

Lab Coordinator: **Vasu Penugonde**

Office: room G77 THORV Building

Ph# 966-4431

email: penugonde.vasu@usask.ca

Teaching assistant: **Kunal Baxi**

Lab: room 245 BIOL Building

Ph# 966-8857

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Recording of Classes

Recording of classes by students is not allowed.

Lecture capture is not currently planned, but will be arranged if students attending classes unanimously agree to it.

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 Disability Services for Students (DSS)

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Disability Services for Students (DSS) if they have not already done so. Students who suspect they may have disabilities should contact DSS for advice and referrals. In order to access DSS programs and supports, students must follow DSS policy and procedures. For more information, check <http://www.students.usask.ca/disability/> or <http://students.usask.ca/health/centres/disability-services-for-students.php#Registration> or contact DSS at 966-7273 or dss@usask.ca.

Students registered with DSS may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through DSS by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by DSS.

Academic Courses Policy

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>

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