

**University of Guelph
College of Biological Science
Department of Molecular and Cellular Biology**

**COURSE OUTLINE
Advanced Concepts in Genetics, MBG*4110
Fall 2015**

Course description: This course presents classical non-Mendelian phenomena, including transposition, gene silencing, position effects and imprinting. Modern advances in gene regulation via epigenetic phenomena will be a central theme, focusing on chromatin structure, transmission and remodeling, and RNA interference as they pertain to organism development and behavior.

Prerequisites: MBG*2020 or MCB*2050

Professor: Dr. K. Yankulov, SCIE3245, yankulov@uoguelph.ca, ext. 56466

Office hours: TTH 10:30-12:00, SCIE2345

Course schedule Lectures: TTH 8:30-9:50 *MCLN 107*

Learning goals and rationale

This course focuses on genetic processes that do not adhere to basic Mendelian laws. We will consider how gene expression activity can change during transmission from cell to cell and from generation to generation. A central theme of this course is the increasing importance of epigenetics; i.e. changes in heritable information that do not correspond to changes in DNA sequence. Such epigenetic mechanisms play key roles in development, disease progression and environmental adaptation. We will emphasise recent experiments that reveal an emerging paradigm for the transmission of heritable information and the control of gene expression. Molecular mechanisms underlying these processes such as transposition, gene silencing, position-effect variegation, epigenetics, imprinting and RNA-mediated gene repression will be examined. Recent discoveries in epigenetic control of organism development, environmental responses and behaviour will be investigated.

Learning outcomes

The students graduating this course will master their knowledge on:

1. Horizontal gene transfer and mobile DNA elements.
2. Eukaryotic gene expression during cell differentiation and adaptation.
3. Mechanisms of non-Mendelian inheritance.
4. Structure and function of chromatin.
5. Mechanisms of DNA replication, chromatin duplication and inheritance of epigenetic state.
6. Role of RNA in epigenetic processes.
7. Analysis of primary literature.
8. Presentation skills.

Course Resources

There is no textbook for this course. Basic information may be found in Principles of Genetics (Snustad and Simmons), other basic texts and on-line resources. Assigned papers and review articles from recent scientific literature are essential components of this course. Links to these papers will be posted on CourseLink.

Course Content

The course consists of lectures, analysis of key scientific papers and student presentations.

STUDENT PRESENTATIONS: Groups of three will present a seminar on a research paper that illustrates important concepts and emerging ideas in the field of epigenetics. The papers and presentation dates are listed in the lecture handouts and separately on Courselink. There are three ways to select a paper for the presentations.

- Papers from the list will be assigned to groups that are formed by the instructor. If you have a **very good reason to NOT to present** on a certain date please advise by the end of the second week of classes.
- If you prefer **certain presentation partners** please advise by the end of the second week of classes. I will assign a paper from the list on WebCT.
- You can form a group and select a paper YOURSELF. It must be from one of the major topics in the lecture panels. You need my approval for this presentation. You have to report your choice by the end of the second week of classes.

Presentations are 15-20 minutes with 5 minutes of questions. 24 hours before the presentation each student will submit a 1000-word **REPORT** that outlines the topic and the key findings. Separately, the whole group will prepare a short (1-2 pages) **HANDOUT** for the class. The individual reports, the handout and the **PP presentation** will be submitted to K.Yankulov at yankulov@uoguelph.ca by noon before the day of presentation. The material presented by student groups will appear on class quizzes and in the final exam. Attendance is expected and strongly encouraged.

FINAL Schedule

Dates	Lecture Panels	Quizzes
Sept.10 Sept.15	Lecture Panel 1: Genetic Paradigms, History of Genetic Thought, "Lamarckian" Inheritance, Chromosome theory.	
Sept.15 Sept.17 Sept.22	Lecture Panel 2: Gene silencing, Chromatin, Histone Code, DNA methylation.	
Sept.24 Sept.29	Lecture Panel 3: Mobile Genetic Elements, Selfish DNA, Suppression of transposon mobility	
Oct.01	Three presentations on Mobile Genetic Elements	
Oct.06	Three presentations on Chromatin and Gene Silencing	
Oct.08	Quiz #1 40 min 10 marks	Quiz #1: Lecture panels 2/3

Oct.08 Oct.15 Oct.20	Lecture Panel 4: Epigenetics 1: Transmission of chromatin, Position-effect variegation, Immune evasion by parasites.	
Oct.22 Oct.27	Lecture Panel 5: Epigenetics 2: X-chromosome inactivation, Genetic imprinting, insulated chromatin domains.	
Oct.29	Three presentations on Epigenetics 1	
Nov.03	Three presentations on Epigenetics 2	
Nov.05	Quiz #2 40 min 10 marks	Quiz #2: Lecture panels 4/5
Nov.05 Nov.10 Nov.12	Lecture Panel 6: Non-coding RNA and chromatin	
Nov.17 Nov.19	Lecture Panel 7: Complex traits and trans-generational inheritance	
Nov.24	Three presentations on Non-coding RNA	
Nov.26	Three presentations on trans-generational inheritance	
Dec.01	Quiz #3 40 min 10 marks	Quiz #3: Lecture panels 6/7
Dec.01	Re-scheduled presentations	
Dec.03	Wrap-up, Review and preparation for the exam	
	FINAL EXAM (Dec.10/2015, 19:00-21:00 p.m.)	

Methods of Assessment

Assessment			
Form of Assessment	Weight of Assessment	Course Content / Activity	Learning Outcome
Quizzes. Three quizzes (10 marks each) will be conducted during the semester as scheduled.	30% total	Lecture, non-lecture	1,2,3,4,5,6
Student Presentations: Slide/handout quality – group mark 10% Presentation Performance – individual mark 10% REPORT-individual mark 10%	30%	Original research paper	7,8
Final Exam will cover all the material in the course, including presentations	40%	Lecture, non-lecture	1,2,3,4,5,6,7

Grading and academic considerations:

- If you miss one quiz the other two quizzes will be used for the calculation of your final mark
- If you receive an academic consideration for a second missed quiz, you will get additional questions (worth 10 marks) to your final exam.
- You will receive incomplete (INC) if you miss all three quizzes
- You will receive incomplete (INC) if you do not participate in a presentation

- Only under exceptional circumstances you can reschedule your presentation for the final week of classes or receive an alternative assignment. You will need academic consideration to do so.
- The final exam is compulsory. You will receive incomplete (INC) if you miss this exam.

Important Dates

Sept. 10	First class
Dec.03	Last class
Oct. 13	No classes
Quizzes	TBA
Nov.06	Course drop deadline
Dec. 10	FINAL EXAM (19:00-21:00 p.m., TBA)

Means of communication:

- Please send an e-mail if you need academic consideration or for other urgent matters
- Please ask for clarifications on assignments in class
- If you need to discuss class material please attend office hours. If these hours are not feasible, please schedule a time slot via e-mail.

Course and University Policies

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, and be prepared to provide supporting documentation. See the undergraduate calendar for information on regulations and procedures for Academic

Consideration: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.csd.uoguelph.ca/csd/>

Academic Misconduct

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 discourages misconduct. 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.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

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

E-mail Communication

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

Drop Date

The last date to drop one-semester courses, without academic penalty, is the 40th class day. To confirm the actual date please see the schedule of dates in the Undergraduate Calendar. For

regulations and procedures for Dropping Courses, see the Undergraduate Calendar:
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

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.

Recording of Materials

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

Campus Resources

The Academic Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

<http://www.uoguelph.ca/registrar/calendars/index.cfm?index>

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

- make an appointment with a program counsellor in your degree program.
<http://www.bsc.uoguelph.ca/index.shtml> or
<https://www.uoguelph.ca/uaic/programcounsellors>

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.
<http://www.learningcommons.uoguelph.ca/>

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.uoguelph.ca/~ksomers/>

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