

**Biology 4561F: GENES AND GENOMES I**

**1.0 Calendar Description**

An examination of the current concepts of organization, transmission and expression of eukaryotic genes in the context of the chromosome. Topics to be covered include chromatin organization and composition, genomic rearrangements, techniques for mapping genes and manipulating genomes. **Antirequisite(s):** The former Biology 461a. **Prerequisite(s):** Biology 3596A/B; and one of the following: Biology 3594A, 3595A, 3597B or the former Biology 390a or 391b; and one additional 0.5 course in Biology at the 3000 level or above; and registration in year 4 of an Honors Specialization module or a Major in Genetics offered through the Department of Biology. **Extra Information:** 2 lecture hours, 0.5 course.

NOTE: Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.<sup>1</sup>

**2.0 Course Information**

<b>Instructor:</b>	Dr. Jim Karagiannis
<b>Office:</b>	BGS 3080
<b>Office Hours:</b>	Thursdays 3:30 - 5:00 p.m.
<b>Phone:</b>	Ext. 80975
<b>Email:</b>	<a href="mailto:jkaragia@uwo.ca">jkaragia@uwo.ca</a>
<b>Lecture Hours:</b>	Tuesdays and Thursdays, 8:30 - 9:20 a.m.
<b>Lecture Location:</b>	BGS 1056

All emails to Dr. Karagiannis must contain "Bio4561F" in the subject line. Emails not containing this keyword will not be read.

### **3.0 Course Website**

Students should check OWL (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL on a regular basis.

### **4.0 Course Objectives**

The sequencing of the human genome in 2001 marked the beginning of a new era in biology that is dominated by two distinct, yet inseparable fields: functional genomics and systems biology. The field of functional genomics seeks to provide an understanding of the function, regulation, and interaction of ALL gene-products in a genome. By its very nature it has relied on technical advances (microarray technology, mass spectrometry) that produce vast data sets describing the characteristics (e.g. expression levels, biochemical activity) of all genes/gene-products in a genome. This explosion of data has necessitated the development of philosophies and techniques – collectively defining the field of systems biology – that are aimed at understanding how the interactions of these complex systems of genes/gene-products give rise to phenotypic variability. The aim of this course is to provide students with firm foundation of both the biological and technological advancements that have taken place in the field of genetics since the dawning of the post-genomic era.

### **5.0 Learning Outcomes**

- Students will develop a comprehensive understanding of the principles of genome assembly and be able to relate how these principles are applied to the creation of synthetic organisms
- Students will be able to describe and discuss the ethical ramifications associated with the emerging discipline of synthetic biology
- Students will be able to describe the experimental methods used to carry out genome-wide association studies (GWAS) and relate how these methods allow scientists to identify disease associated genetic variants
- Students will become familiar with the concept of machine learning and understand how this method is applied to the analysis of large, complex, genome-level data sets
- Students will be able to analyze and discuss the ramifications of high throughput, massively parallel next generation sequencing technologies
- Students will understand how synthetic genetic array analysis is used to generate genetic interaction maps and how these maps provide insight into the genotype-phenotype relationship

- Students will be able to critically analyze select, high impact articles from the primary literature and assess their overall biological significance and societal impact

## 6.0 Textual Resources

Due to the great speed with which the discipline of genetics has advanced in recent years, the use of a traditional textbook would be both insufficient and impractical as a learning resource in this course. Instead the course will make extensive use of contemporary review articles from the field's most respected journals (e.g. Nature Reviews Genetics, Cell, Genes and Development). These articles, written by the leading individuals conducting the research, will provide a much more realistic and up to date view of the field than any available textbook.

## 7.0 Evaluation

Biology 4561F is officially designated an essay course by the Faculty of Science. According to University guidelines "an essay course must normally involve total written assignments (essays or other appropriate prose composition, excluding examinations) as follows: Half course (2000 and above): at least 2500 words." In addition, "the structure of the essay course must be such that in order to pass the course, the student must exhibit some minimal level of competence in essay writing and the appropriate level of knowledge of the content of the course."

The mark breakdown will be as follows:

<b>Term Test 1</b> (In class October 5th):	15%
<b>Term Test 2</b> (In class November 9th):	15%
<b>Final Exam</b> (To be scheduled by the Registrar):	30%
<b>Essay</b> (2000 words, due November 14th):	20%
<b>Essay Proposal</b> (Due October 24th):	2.5%
<b>Group Presentation Proposal</b> (Due Nov. 7th):	2.5%
<b>Group Presentation</b> (To be scheduled during class time; beginning November 21st)	15%

Aside from the specified calculator, no other electronic devices (phones, iPods, etc.) may be in your possession during tests and exams, even for timekeeping purposes. Essays will be written on an individual basis. Presentations will be carried out in groups of 3-4.

## **8.0 Accessibility**

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation.

## **9.0 Support Services**

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation.

The policy on Accommodation for Students with Disabilities can be found here:  
[www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_disabilities.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_disabilities.pdf)

The policy on Accommodation for Religious Holidays can be found here:  
[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_religious.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf)

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Students who are in emotional/mental distress should refer to Mental Health@Western ([http://www.health.uwo.ca/mental\\_health](http://www.health.uwo.ca/mental_health)) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC, <http://westernusc.ca/services>.

## **10.0 Policy Regarding Illness**

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or supporting documentation to the Academic Counselling Office of your home faculty as soon as possible. If you are a Science student, the Academic Counselling Office of the Faculty of Science is located in WSC 140, and can be contacted at [scibmsac@uwo.ca](mailto:scibmsac@uwo.ca).

For further information, please consult the university's medical illness policy at [http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_medical.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf).

If you miss the Final Exam, please contact your faculty's Academic Counselling Office as soon

as you are able to do so. They will assess your eligibility to write the Special Exam. You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (see [http://www.registrar.uwo.ca/examinations/exam\\_schedule.html](http://www.registrar.uwo.ca/examinations/exam_schedule.html)).

### **11.0 Notes on Plagiarism**

NOTE: Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).<sup>1</sup>

NOTE: All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com

### **12.0 Scholastic Offences**

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following web site: [http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_grad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf)

<sup>1</sup> Portions of these sections were taken from the following sources: Academic Calendar; Academic Handbook of Senate