



UNIVERSITY OF CALGARY

DEPARTMENT OF BIOLOGICAL SCIENCES COURSE OUTLINE

1. **Course:** **Biology 311 - Principles of Genetics**

Lecture Section(s): L01 MWF 11:00 ENA 201 FALL 2016
L02 MWF 13:00 ICT 102

LABS: T 08:30, 12:00, 15:30 EEEL 303, 309 and 369
R 08:30, 12:00, 15:30 EEEL 303, 309 and 369
W 15 :30 EEEL 303, 309 and 369
M 15 :30 EEEL 303, 309 and 369

All scheduled laboratories will begin the week of September 20, 2016. Students need to read the introduction and Lab #1 prior to attending the first lab and be comfortable with all terms used.

Course Coordinator: Dr. David Hansen

Instructor(s): Dr. David Hansen BI 240A 220-7496 dhansen@ucalgary.ca
Dr. Isabelle Barrette-Ng BI 430A 220-6240 mibarret@ucalgary.ca

This course will use the D2L online system.

Biological Sciences Department BI 186 403-220-3140 biosci@ucalgary.ca

2. **Prerequisites:** Any two of Biology 231, 233, 241 and 243.

See section 3.5.C in the Faculty of Science section of the online calendar
www.ucalgary.ca/pubs/calendar/current/sc-3-5.html

3. **Grading:** The University policy on grading and related matters is described sections [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments	6%		
Midterm Exam	32%	(2 hours)*	ST 140/148
Final Exam	32%	(2 hours)*	
Laboratory	30%**		

There will be a final examination covering material from the last 1/2 of the course scheduled by the Registrar's Office between the 12th and 22nd of December inclusive.

**Various lab components have predetermined weighting to a total of 30% as specified in the Lab Manual.

Each piece of work (assignment, laboratory report, midterm test or final examination) submitted by the student will be assigned a percentage score. The student's average percentage score for the various components listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.3](#) of the University Calendar

5. **Scheduled out-of-class activities:** Dates and times of approved class activities held outside of class hours.

* **Midterm- Saturday, October 29, 2016 2:00 p.m. ST 140/148**

REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY. If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

6. **Course Materials:** An Introduction to Genetic Analysis. 11th ed., Griffiths, Wessler, Carroll, Doebley (**10th ed. is also acceptable**)

Solutions Megamanual for An Introduction to Genetic Analysis, 11th Edition, Fixsen, W.D., Lavett, D.K., W.H. Freeman. (**10th ed. is also acceptable**). For those who purchase a new hardcopy of the text, or an electronic version, the solutions manual is available at no additional cost through the Launchpad website. <http://www.macmillanhighered.com/launchpad/iga11e/3676698>

Carolina Drosophila Manual, Flagg, R.O., 5th Edition, Carolina Biological Supply Company

Biology 311 Laboratory Manual, Fall 2016 (To be downloaded from D2L)

7. **Examination Policy:** Non-programmable calculators are permissible during examinations. Students should also read the Calendar, [Section G](#), on Examinations.
8. In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports. See also [Section E.2](#) of the University Calendar.

9. ETHICS IN THE BIOLOGICAL SCIENCES

Studies in the Biological Sciences involve the use of living and dead organisms. Students taking laboratory- and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

10. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **Academic Misconduct:** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties
- (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- (c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students *with Disabilities available at* http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf.
- Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Biological Sciences, Dr. H. Addy by email addy@ucalgary.ca or phone 403 220-3140.
- (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **Student Union Information:** VP Academic Phone: 403 220-3911 Email: suvpaca@ucalgary.ca
SU Faculty Rep. Phone: 403 220-3913 Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca;
Student Ombuds Office: 403 220-6420 Email: ombuds@ucalgary.ca; <http://ucalgary.ca/provost/students/ombuds>

- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- (h) At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

Department Approval _____ ORIGINAL SIGNED _____ Date _____

Associate Dean's Approval for
out of regular class-time activity: _____ ORIGINAL SIGNED _____ Date: _____
B311 F16; 8/10/2016 11:00 AM

Course Outcomes

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

1. describe, using diagrams, the similarities and differences in chromosome behaviour between mitosis and meiosis.
2. illustrate how chromosomal behaviour in meiosis underlies Mendel's laws.
3. identify the inheritance pattern of traits by using pedigree analysis and an understanding of chromosome behavior in meiosis.
4. determine gene linkage and calculate genetic map distances by analyzing inheritance patterns using appropriate statistical methods.
5. describe the epistatic relationship between genes in a given process based on phenotypic inheritance patterns.
6. illustrate how different alleles of a gene can form using the physicochemical properties of nucleic acids and the molecular anatomy of genes in prokaryotes and eukaryotes.
7. compare and contrast the regulation of gene expression in prokaryotes and eukaryotes.
8. design experiments to evaluate the effects, if any, of mutations on gene expression.
9. identify techniques that can be used to alter the genetic information in a given piece of DNA, and describe how they can be used for gene therapy.
10. evaluate data mined from online databases to propose a hypothesis describing the molecular basis for a genetically-inheritable disease.

GRADING SCALE

95 and over = A plus
90 and over = A
85 and over = A minus
80 and over = B plus
76 and over = B
72 and over = B minus
68 and over = C plus
64 and over = C
60 and over = C minus
55 and over = D plus
50 and over = D
under 50 = F

TENTATIVE SCHEDULE FALL 2016

Date	Topics	Chapter	Lecturer
September 12	Explanation of course outline, exams schedule, labs, percentage weights and reading assignments. Example of genetic analysis		Dr. Hansen
September 14	Autosomal inheritance, sex-linked inheritance, cytoplasmic inheritance, pedigree analysis	2	Dr. Hansen
September 16	Independent assortment of genes	3	Dr. Hansen
September 19		3	Dr. Hansen
September 21		3	Dr. Hansen
September 23	Linkage, recombination, genetic mapping, chi-square, multiple cross-overs	4	Dr. Hansen
September 26		4	Dr. Hansen
September 28		4	Dr. Hansen
September 30		4	Dr. Hansen
October 3	Bacterial and viral genetics	5	Dr. Hansen
October 5		5	Dr. Hansen
October 7		5	Dr. Hansen
October 10	No Lecture- Thanksgiving		
October 12	Gene Interactions: Dominance, epistasis, biosynthetic pathways	6	Dr. Hansen
October 14			
October 17		6	Dr. Hansen
October 19		6	Dr. Hansen
October 21	Large-scale chromosomal changes	17	Dr. Hansen
October 24	Large-scale chromosomal changes	17	Dr. Hansen
October 26	What is a gene and how can genetic variability be introduced? A review of the Central Dogma and the structure of DNA	Portions of 1, 7	Dr. Barrette-Ng
October 28	Detecting genetic variability in the human genome – a look at PCR, DNA sequencing and gel electrophoresis	Portions of 10 and 14	Dr. Barrette-Ng
October 29	MIDTERM 2:00 – 4:00 pm ST140 & ST148		
October 31	Genetic variability and DNA polymorphisms – an overview of the different classes of DNA polymorphisms and methods used for their detection	Portions of 10, 16 and 18	Dr. Barrette-Ng
November 2			
November 4	Do all DNA polymorphisms have phenotypic consequences?	Portions of 14, 16, 18	Dr. Barrette-Ng
November 7	Case studies on DNA polymorphisms, ancestry and disease	Portions of 18	Dr. Barrette-Ng
November 9	Genetic variability and the control of gene expression in prokaryotes: How a nutritional signal controls expression of the lac operon	Portions of 11	Dr. Barrette-Ng
November 11	No Lecture- Reading Days		
November 14	Genetic variability and the control of gene expression in prokaryotes: How a nutritional signal controls expression of the lac operon	Portions of 11	Dr. Barrette-Ng

November 16	Genetic variability and the control of gene expression in eukaryotes: How a nutritional signal controls expression of the GAL system	Portions of 12	Dr. Barrette-Ng
November 18	Introducing genetic variability through genetic engineering and the manipulation of DNA	Portions of 10	Dr. Barrette-Ng
November 21	Inheritance and genetic variability: is it all in the genes?	Portions of 12	Dr. Barrette-Ng
November 23	Control of gene expression and the process of development in eukaryotes	Portions of 13	Dr. Barrette-Ng
November 25	Gene regulation, development and RNA? An overview of miRNA	Portions of 8 and 13	Dr. Barrette-Ng
November 28	The story of jumping genes – introduction to transposable elements	Portions of 15	Dr. Barrette-Ng
November 30	Altering the message – the genetics of cancer	Portions of 16	Dr. Barrette-Ng
December 2	Inheritance of complex traits	Portions of 19	Dr. Barrette-Ng
December 5	Curing genetic diseases? An overview of genetic therapies	Portions of 10	Dr. Barrette-Ng
December 7	Medical Genetics		Dr. Argiropoulos
December 9	Ethical issues in genetics- cloning, genetic testing, gene therapy, prenatal diagnosis and pre-implantation genetic testing		Dr. Hansen
December 12-22	Final exam scheduled by Registrar. This will be a comprehensive Final Exam covering all material in the course, but with emphasis on topics covered since mid-term		