

The University of Manitoba
Faculty of Agricultural and Food Sciences



COURSE TITLE: INTERMEDIATE PLANT GENETICS

Department Plant Science **Course Number** PLNT 4330

Academic Session Fall 2011 **Credit Hours** 3

Prerequisites and how they apply to this course:

PLNT 2520 or BIOL 2500 or the former BOTN 2460 provide the basics for this course.

Classroom Location 134 Agriculture Building

Meeting Days and Class Hours Slot 6, 11:30 Mon, Wed, Fri

Lab/Seminar Location 134 Agriculture Building **Lab/Seminar/Hours:** Slot 11, 2:30 Fri
134 Agriculture Building

Department Office location: PS 222 Agriculture **Phone Number** 474-8224

Course Web Page (if applicable)

Instructor Information

Name & Title Dr. Douglas J. Cattani

Office Location Room 207 Agriculture

Office Phone Number 474-6071

Office Hours By appointment

Email Address cattani@cc.umanitoba.ca

Teaching Assistant(s) (if applicable): TBA

TA Office Hours and Location: TBA

Course Philosophy

Students' Learning Responsibilities

Students are expected to attend class regularly, read assigned materials in a timely manner, participate in discussion and complete all assignments and examinations with academic integrity and honesty. Students are encouraged to ask questions for clarification and seek assistance from instructors if they require additional explanations or resources. In addition, students are expected to conduct themselves in a manner that is respectful of the learning environment, other students and instructors.

Why this course is useful?

This course is useful in providing the student with the information required to proceed into a breeding and/or genetics option, into biotechnology and for preparation for graduate studies. This course provides an extension of the introductory genetics principles and exposes the students to concepts required to develop an appreciation of the function of genetics in today's world.

Who should take this course?

- 1) Students interested in a career in genetics.
- 2) Students interested in biotechnology.
- 3) Students interested in graduate studies in plant breeding or biotechnology.

How this course fits into the curriculum

This course is a restricted elective in the Plant Biotechnology option of the B.Sc. Agriculture degree.

Course Description/Objectives

Undergraduate Calendar Description

A study of gene behaviour as related to genetic analyses of data from plant populations; multiple allelic systems and polygenic inheritance of quantitative traits; extra-chromosomal inheritance and the significance of cytoplasmic influence. Examples will be drawn from experimental data where available.

Instructional Methods

A combination of instructional methods will be used in this course. Traditional in class lectures will be delivered. Laboratory sessions will be used for practical instruction on the solving of genetic problems to compliment lecture materials.

Course Objectives:

Provide students with the information required for advancement through the biotechnology option, to provide students with interests in breeding options at graduate level educational opportunities.

Learning outcomes

Learning outcomes assist: i) students to identify the knowledge, skills, attitudes and personal attributes expected of them to successfully complete their program of studies; ii) faculty to develop learning goals and objectives in their courses and programs, in prioritizing and focusing the learning experiences, and in the selection of appropriate assessment tools and; iii) potential students and outside agencies to assess the quality of our academic programs.

These learning outcomes areas include:

Scholar, Content and technical expertise, Social accountability, Communicator, and Professional

Additional Comments:

Description of Examinations

GRADING SYSTEM:		SCHEDULE:
Tutorial Exam I	15%	Friday, October 21, 2011
Midterm Lecture Exam	25%	Friday, October 28, 2011
Tutorial Exam II	15%	Friday, December 02, 2011
Final Lecture Exam	45%	Scheduled by Student Records in the December examination period.

Description of Assignments

Not applicable

Assignment Due Dates

Not applicable

Grade Evaluation

GRADING SYSTEM:		SCHEDULE:
Tutorial Exam I	15%	Friday, October 21, 2011
Midterm Lecture Exam	25%	Friday, October 28, 2011
Tutorial Exam II	15%	Friday, December 02, 2011
Final Lecture Exam	45%	Scheduled by Student Records in the December examination period.

Grades from the Tutorial Exam I and Midterm Lecture Exam will be available prior to the voluntary withdrawal deadline of November 16, 2011.

Important Dates (e.g., voluntary withdrawal date)

Voluntary withdrawal deadline is November 16, 2011.

Texts, Readings, Materials

Textbook(s) – Authors, Titles, Edition

Elrod, S. and Stansfield, W. D. (2010) GENETICS 5th Edition. Schaum's Outlines Series. McGraw-Hill Inc. Toronto

Supplementary Reading

Additional Materials

Course Policies

Late Assignments

Not applicable.

Missed Assignments

Not applicable.

Missed Exams: Unexcused missed exams will be given a grade of zero. Where exams other than the final exam are missed and excused through written notification such as a doctor's certificate of illness, evidence of death in the family, or other circumstances that are beyond the control of the student, the student may be given the following options: i) re-schedule a date for the exam with the instructor and complete the exam at that time (the instructor has the option to set a different exam); or, 2) the final grade will be determined by increasing the value of the final examine by the amount that would have been allocated to the missed exam. If the final exam is missed and an appropriate excuse has been provided, another exam date will be set at the discretion of the instructor.

Academic Integrity

Plagiarism or any other form of cheating in examinations, term tests or academic work is subject to serious academic penalty. Cheating in examinations or tests may take the form of copying from another student or bringing unauthorized materials into the exam room. Exam cheating can also include exam impersonation. A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty. Students should acquaint themselves with the University's policy on plagiarism, cheating, exam impersonation and duplicate submission (see Section 7, p. 29 in the University of Manitoba Undergraduate Calendar 09/10).

Additional Comments:

Use of Third Party Detection and Submission Tools

Electronic detection tools may be used to screen assignments in cases of suspected plagiarism.

Group Work Policies: Not applicable.

Course Content

I. Review of Mendelian Principles

1. Introduction to genetics research, mitosis, meiosis and gametogenesis **Sep. 9**
2. Segregation, assortment, dominance relationships, multiple allelic series **Sep. 12**

II. Altered Segregation

3. Altered segregation I **Sep. 14**
4. Altered segregation II **Sep. 16**
5. Gene interaction - epistasis **Sep. 19**

III. Statistics in Genetics

6. Probability, chi-squared tests **Sep. 21**
7. Distributions and minimum family size **Sep. 23**

IV. Gene linkage, Recombination and Mapping

8. Detection of linkage **Sep. 26**
9. Gene mapping in diploids I **Sep. 28**
10. Gene mapping in diploids II **Sep. 30**
11. Linkage and mapping in fungi I **Oct. 3**
12. Linkage and mapping in fungi II **Oct. 5**
13. Linkage and mapping in bacteria **Oct. 7**

V. Large Changes in Genetic Material

14. Variation in chromosome numbers **Oct. 12**
15. Segregation and linkage in polyploids I **Oct. 14**
16. Segregation and linkage in polyploids II **Oct. 17**
17. Changes in chromosome structure **Oct. 19**

VI. Genes in Populations

18. Gene frequencies and equilibrium **Oct. 21**
19. Factors operating to direct change I **Oct. 24**
20. Factors operating to direct change II **Oct. 26**
- 21. MID-TERM LECTURE EXAM - MONDAY, OCTOBER 28, 2011**
22. Factors operating to direct change III **Oct. 31**
23. Factors operating to direct change IV **Nov. 2**
24. Inbreeding **Nov. 4**

VII. Quantitative Genetics

25. Is part of continuous variation heritable? **Nov. 7**
26. Analysis of quantitative characters using means **Nov. 9**
27. Analysis of quantitative characters using variances **Nov. 14**
28. Analysis of quantitative trait loci using molecular markers **Nov. 16**

VIII. Cytoplasmic Genetics

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| 29. Maternal effects and cytoplasmic inheritance | Nov. 19 |
| 30. Mitochondria and plastid gene transmission and recombination | Nov. 21 |
| 31. Cytoplasmic male sterility systems and plant breeding | Nov. 23 |

IX. Mutation, Genetic Engineering

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| 32. Gene mutation | Nov. 26 |
| 33. Induced genetic changes | Nov. 28 |
| 34. Genetic engineering and crop improvement I | Nov. 30 |
| 35. Genetic engineering and crop improvement II | Dec. 3 |
| 36. Marker assisted selection and crop improvement | Dec. 5 |

REVIEW Dec. 7

TUTORIAL OUTLINE, FALL 2011

DATE	Tutorial Topics	
Sep. 16	1. Mendelian genetics	
Sep. 23	2. Altered segregation problems	
Sep. 30	3. Statistics in genetics problems	
Oct. 07	4. Linkage problems I	
Oct. 14	5. Linkage problems II	
Oct. 21	6. TUTORIAL EXAM #1	OCTOBER 21, 2011
Oct. 28	7. Large changes in genetic material problems	
Nov. 04	8. Population genetics problems I	
Nov. 18	9. Population genetics problems II	
Nov. 25	10. Population genetics problems III	
Dec. 02	12. TUTORIAL EXAM #2	DECEMBER 02, 2011