Syllabus

PLNT2530: Plant Biotechnology

Winter 2023
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COURSE DETAILS

Course Title & Number: PLNT2530 Plant Biotechnology

Number of Credit Hours: 3

Class Times & Days of Week: MWF 11:30 - 12:20

Location for classes/labs/tutorials: Agriculture 134

Pre-Requisites: Prerequisites: CHEM 2360 or MBIO2360 or CHEM 2770 (or 002.277) or MBIO 2770 (or 060.277) and PLNT 2520 (or 039.252) or BIOL 2500 or the former BOTN 2460 (or 001.246).

Instructor Contact Information

Instructor(s) Name & Preferred Form of Address: Dr. Fristensky

Office Location: 330 Agriculture

Office Hours or Availability: 12:30 - 3:00 p.m. Mon., Wed.

Office Phone No. 204-474-6085

Email: brian.fristensky@umanitoba.ca

Note: All email communication must conform to the Communicating with Students university policy.

Contact: Stop in at office hours, make appointments by email, ask questions by email. WebEx appointments may also be arranged by email.

Course Description

U of M Course Calendar Description
An introduction to current biotechnological techniques, including recombinant DNA, plant tissue culture, plant transformation and regeneration and bioinformatics. A background to the techniques as well as a
discussion of their applications in current biology and crop production will be examined. A laboratory will provide first hand experience with many of the techniques.

**Course Goals**
Students will learn the basics of plant propagation in tissue culture, recombinant DNA, cloning libraries, the structure and function of plant genes and genomes, and genomic technologies. Based on those technologies, we will introduce contemporary approaches in plant biotechnology, including transformation by Agrobacterium and biolistic, gene editing, and their applications to genetic engineering of plant traits.

**Course Learning Objectives**
Students will learn the principles of plant tissue culture, recombinant DNA, cloning libraries, the structure and function of plant genes and genomes, and genomic technologies. Students are responsible for attaining adequate mastery of these technologies in order to understand the later course topics on plant transformation, gene editing, and genetic engineering of plant traits.

**Textbook, Readings, and Course Materials**

There is no required textbook. All lecture notes will be available on the course web site.

**Using Copyrighted Material**

Please respect copyright. We will use copyrighted content in this course. I have ensured that the content I use is appropriately acknowledged and is copied in accordance with copyright laws and university guidelines. Copyrighted works, including those created by me, are made available for private study and research and must not be distributed in any format without permission. Do not upload copyrighted works to a learning management system (such as UM Learn), or any website, unless an exception to the Copyright Act applies or written permission has been confirmed. For more information, see the University’s Copyright Office website at [http://umanitoba.ca/copyright/](http://umanitoba.ca/copyright/) or contact [um_copyright@umanitoba.ca](mailto:um_copyright@umanitoba.ca).

**Course Technology**

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. The student can use all technology in classroom setting only for educational purposes approved by instructor and/or the University of Manitoba Student Accessibility Services. Student should not participate in personal direct electronic messaging / posting activities (e-mail, texting, video or voice chat, wikis, blogs, social networking (e.g. Facebook) online and offline “gaming” during scheduled class time. If student is on call (emergency) the student should switch his/her cell phone on vibrate mode and leave the classroom before using it. (©S Kondrashov. Used with permission)

**Expectations: I Expect You To**

I expect students to attend class, participate in class discussions, and to ask questions at any time during lectures that questions arise.
I will treat you with respect and would appreciate the same courtesy in return. See Respectful Work and Learning Environment Policy.

At the end of this section, the policies and services students are expected to follow/utilize need to be included (Section 2.5 ROASS).

I expect you to follow these policies around Class Communication, Academic Integrity, and Recording Class Lectures.

**Class Communication:**
You are required to obtain and use your University of Manitoba email account for all communication between yourself and the university. All communication must comply with the Electronic Communication with Student Policy:
http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html

**Academic Integrity:**
Each student in this course is expected to abide by the University of Manitoba Academic Integrity principles. Always remember to reference the work of others that you have used. Also be advised that you are required to complete your assignments independently unless otherwise specified. If you are encouraged to work in a team, ensure that your project complies with the academic integrity regulations. You must do your own work during exams. Inappropriate collaborative behavior and violation of other Academic Integrity principles, will lead to the serious disciplinary action. Visit the Academic Calendar, Student Advocacy, and Academic Integrity web pages for more information and support.

Refer to specific course requirements for academic integrity for individual and group work such as:

I. Group projects are subject to the rules of academic dishonesty;
II. Group members must ensure that a group project adheres to the principles of academic integrity;
III. All assignments are individual assignments, but students may discuss the assignments with each other. Remember, the other person isn’t always right. Incorrect answers propagate just as easily as correct answers.
IV. Lab reports are individual, but may be based on group results
V. All work should be completed independently unless otherwise specified.

It is expected that materials submitted by a student in completion of an assignment are the independent and original work of that student.

It will be considered a violation of University policies on academic integrity for a student to:
- copy or paraphrase all or part of the work of other students, including documents, or files containing data, output, programs or graphics created by other students as part of any assignment
- present the ideas of other students as their own
- present ideas, documents, data, output, programs or graphics from external sources as their own, without citation of the external source

It is critical that you be able to document your work. No credit will be given for results that are presented without any evidence of how the results were obtained. For example, it would be evidence of plagiarism to hand in results along with a program, script or spreadsheet that could not possibly have generated the results presented.

Students who have questions regarding clarification of the particulars of an assignment (eg. what is to be handed
in, the meaning of an instruction, how to use a particular program) should contact the instructor. However, the instructor will not do the assignment for you. That is, it is not acceptable to converge upon the answer by returning repeatedly to the instructor with questions such as "Is this the answer?" until you eventually arrive at the correct answer. The assignment is meant to be an assessment of your ability to solve a problem systematically, using the skills taught in class.

Recording Class Lectures:
No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission of the Instructor. Course materials (both paper and digital) are for the participant’s private study and research.

Student Accessibility Services:
The University of Manitoba is committed to providing an accessible academic community. Students Accessibility Services (SAS) offers academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

Student Accessibility Services
520 University Centre
Phone: (204) 474-7423
Email: Student_accessibility@umanitoba.ca

Expectations: You Can Expect Me To
I give a lecture-style presentation at each class period listed in the class schedule. I will answer questions to the best of my knowledge during class and during appointments or by email or videoconferencing.

I will not give you the answers to an assignment, although I will answer legitimate questions pertaining to an assignment. It is not answer a series of questions designed to arrive at the answer by trial and error, such as "Is this right? How about this? Or this". I will always give you enough information in the assignment itself to answer the questions.

CLASS SCHEDULE AND COURSE EVALUATION
This schedule is subject to change at the discretion of the instructor and/or based on the learning needs of the students but such changes are subject to Section 2.8 of ROASS.

<table>
<thead>
<tr>
<th>Date</th>
<th>Duration</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 9, 11</td>
<td>2</td>
<td>Overview of Course, Introduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Plant regeneration through tissue culture</td>
</tr>
<tr>
<td>Jan. 13, 16, 18</td>
<td>3</td>
<td>2. Review of nucleic acids</td>
</tr>
<tr>
<td>Jan. 27, 30</td>
<td>2</td>
<td>4. Nuclear Gene Structure and Expression</td>
</tr>
<tr>
<td>Feb. 1, 3</td>
<td>2</td>
<td>5. Genomes: Organization and Comparisons</td>
</tr>
<tr>
<td>Date</td>
<td>Day(s)</td>
<td>Topic</td>
</tr>
<tr>
<td>------------</td>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Feb. 6</td>
<td></td>
<td>Bioinformatics I - Introduction to Linux</td>
</tr>
<tr>
<td>Feb. 8, 10, 13</td>
<td>1</td>
<td>6. Gene Cloning, Mapping and Sequencing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A. Vectors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Libraries (cDNA, Genomic)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Gene isolation based on a known gene product</td>
</tr>
<tr>
<td>Feb. 15</td>
<td></td>
<td>6. Gene Cloning, Mapping and Sequencing (cond.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D. Gene isolation when the gene product is unknown</td>
</tr>
<tr>
<td>Feb. 17 (Web)</td>
<td>1</td>
<td>Bioinformatics II: Searching for and retrieving sequences from NCBI</td>
</tr>
<tr>
<td>Feb. 20 - 24</td>
<td></td>
<td>Winter Term Break</td>
</tr>
<tr>
<td>Mar. 27</td>
<td></td>
<td>D. Gene isolation when the gene product is unknown (cond.)</td>
</tr>
<tr>
<td>Mar. 1</td>
<td></td>
<td>Mid Term Exam</td>
</tr>
<tr>
<td>Mar. 3</td>
<td></td>
<td>6. Gene Cloning, Mapping and Sequencing (cond.)</td>
</tr>
<tr>
<td>Mar. 6, 8</td>
<td></td>
<td>E. DNA Sequencing</td>
</tr>
<tr>
<td>Mar. 10, 13, 15</td>
<td>1</td>
<td>7. Genomics, Transcriptomics, Proteomics, Metabolomics</td>
</tr>
<tr>
<td>Mar. 10, 13, 15</td>
<td>2</td>
<td>8. Genetic Engineering - Plant Transformation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A. <em>Agrobacterium</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Direct gene transfer (biolistic, electroporation)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Factors influencing expression of transgenes</td>
</tr>
<tr>
<td>Mar. 17 (Web)</td>
<td>1</td>
<td>Bioinformatics III - Simulated Cloning</td>
</tr>
<tr>
<td>Mar. 20</td>
<td></td>
<td>9. Genome Editing</td>
</tr>
<tr>
<td>Mar. 22, 24, 27</td>
<td>1</td>
<td>10. Applications of Genetic Engineering in Plants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A. Herbicide tolerance genes in weed control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Insecticidal proteins</td>
</tr>
<tr>
<td>Mar. 29</td>
<td></td>
<td>10. Applications of Genetic Engineering in Plants (cond.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Novel proteins</td>
</tr>
<tr>
<td>Mar. 31</td>
<td></td>
<td>10. Applications of Genetic Engineering in Plants (cond.)</td>
</tr>
<tr>
<td>Apr. 3, 5</td>
<td></td>
<td>Bioinformatics IV - In-silico cloning of genes by PCR</td>
</tr>
</tbody>
</table>
D. Novel traits

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr. 7</td>
<td>Good Friday (University closed)</td>
</tr>
<tr>
<td>April 10, 12</td>
<td>2. Substantial Equivalence</td>
</tr>
<tr>
<td></td>
<td>Final Exam Week Apr. 14 - 28</td>
</tr>
</tbody>
</table>

Lab Expectations

Students are expected to work professionally and carefully in the lab, with safety as the primary consideration. Your responsibilities include sharing of equipment, working efficiently and in an orderly fashion, labelling all samples to identify their contents, and cleaning up when work is completed.

Lab Schedule

This schedule is subject to change at the discretion of the instructor and/or based on the learning needs of the students but such changes are subject to Section 2.8 of ROASS.

<table>
<thead>
<tr>
<th>Week</th>
<th>TOPIC</th>
<th>Write-up Due</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 9</td>
<td>Sterilization and Aseptic Techniques</td>
<td>Feb. 7</td>
<td>10</td>
</tr>
<tr>
<td>Jan. 16</td>
<td>Agrobacterium-Mediated Plant Transformation (Part I)</td>
<td>Mar. 13</td>
<td>30</td>
</tr>
<tr>
<td>Jan. 30</td>
<td>Plant Regeneration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mar. 20</td>
<td>Isolation of Genomic DNA</td>
<td>Apr. 3</td>
<td>30</td>
</tr>
<tr>
<td>Mar. 27</td>
<td>Agrobacterium-Mediated Plant Transformation (Part II)</td>
<td>Apr. 17</td>
<td>30</td>
</tr>
<tr>
<td>Apr. 3</td>
<td>Agrobacterium-Mediated Plant Transformation (Part II)</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>
## Grading

<table>
<thead>
<tr>
<th>Grade Point</th>
<th>Letter Grade</th>
<th>Meaning</th>
<th>comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5 (90 - 100%)</td>
<td>A+</td>
<td>Exceptional</td>
<td>synthesis, ability to put things together from different parts of the course, original and creative thinking</td>
</tr>
<tr>
<td>4.0 (80 - 89%)</td>
<td>A</td>
<td>Excellent</td>
<td></td>
</tr>
<tr>
<td>3.5 (70 - 79%)</td>
<td>B+</td>
<td>Very good</td>
<td>learning concepts or inferring them from the context; working with data eg. Given the results of an experiment, what does it tell you? Given an equation, can you use it correctly?</td>
</tr>
<tr>
<td>3.0 (60 - 69%)</td>
<td>B</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>2.5 (50 - 59%)</td>
<td>C+</td>
<td>Satisfactory</td>
<td>memoration of facts</td>
</tr>
<tr>
<td>2.0 (40 - 49%)</td>
<td>C</td>
<td>Adequate</td>
<td></td>
</tr>
<tr>
<td>1.5 (30 - 39%)</td>
<td>D+</td>
<td>Marginal</td>
<td></td>
</tr>
<tr>
<td>1.0 (20 - 29%)</td>
<td>D</td>
<td>Marginal</td>
<td></td>
</tr>
</tbody>
</table>

## Voluntary Withdrawal

**Voluntary Withdrawal (VW) deadline**

Last date to withdraw and not receive a final grade; students cannot withdraw from courses after this date.

- **Fall Term classes** Nov 22, 2022
- **Fall/Winter Term spanning classes**
- **Winter Term classes** Jan 20, 2023
- **Mar 22, 2023**
- **Winter/Summer Term spanning distance and online courses** May 11, 2023

### 1.2.4 Fee Deadlines

**Fee Payment Deadline**

A financial penalty will be assessed on accounts with an outstanding balance after this date.

- **Fall Term Oct 5, 2022**
ASSIGNMENT DESCRIPTIONS

Dates are subject to change, in order to make sure that all necessary material has been covered in class.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>handed out*</th>
<th>due*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1</td>
<td>Feb. 6</td>
<td>Feb. 13</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>Feb. 17</td>
<td>Feb. 27</td>
</tr>
<tr>
<td>Assignment 3</td>
<td>Mar. 17</td>
<td>Mar. 24</td>
</tr>
<tr>
<td>Assignment 4</td>
<td>Mar. 31</td>
<td>Apr. 7</td>
</tr>
</tbody>
</table>

Referencing Style

No specific format required.

Assignment Feedback

Assignments will be handed in as PDF documents on UMLearn, and feedback will be given on UMLearn.

Assignment Extension and Late Submission Policy

Due dates for assignments will given for each assignment. Grades on assignments handed in late will be decremented by one point per day late, for a maximum of 5 points. No assignments will be accepted after answers are handed out or discussed in class.

UNIVERSITY SUPPORT OFFICES & POLICIES

Instructors shall provide to every student the information on university support offices and policies in Schedule “A” within the first week of classes, either through a paper copy and/or via the university’s student information system (i.e., Aurora, UM Learn, or such other university information system as may be approved by the university from time to time).

Schedule “A”

Section (a) sample re: A list of academic supports available to Students, such as the Academic Learning Centre, Libraries, and other supports as may be appropriate:

Writing and Learning Support

The Academic Learning Centre (ALC) offers services that may be helpful to you throughout your
academic program. Through the ALC, you can meet with a learning specialist to discuss concerns such as time management, learning strategies, and test-taking strategies. The ALC also offers peer supported study groups called Supplemental Instruction (SI) for certain courses that students have typically found difficult. In these study groups, students have opportunities to ask questions, compare notes, discuss content, solve practice problems, and develop new study strategies in a group-learning format.

You can also meet one-to-one with a writing tutor who can give you feedback at any stage of the writing process, whether you are just beginning to work on a written assignment or already have a draft. If you are interested in meeting with a writing tutor, reserve your appointment two to three days in advance of the time you would like to meet. Also, plan to meet with a writing tutor a few days before your paper is due so that you have time to work with the tutor’s feedback.

These Academic Learning Centre services are free for U of M students. For more information, please visit the Academic Learning Centre website at: http://umanitoba.ca/student/academiclearning/

You can also contact the Academic Learning Centre by calling 204-480-1481 or by visiting 205 Tier Building.

**University of Manitoba Libraries (UML)**

As the primary contact for all research needs, your liaison librarian can play a vital role when completing academic papers and assignments. Liaisons can answer questions about managing citations, or locating appropriate resources, and will address any other concerns you may have, regarding the research process. Liaisons can be contacted by email or phone, and are also available to meet with you in-person. A complete list of liaison librarians can be found by subject: http://bit.ly/WcEbA1 or name: http://bit.ly/1tJ0bB4. In addition, general library assistance is provided in person at 19 University Libraries, located on both the Fort Garry and Bannatyne campuses, as well as in many Winnipeg hospitals. For a listing of all libraries, please consult the following: http://bit.ly/1sxYe6RA. When working remotely, students can also receive help online, via the Ask-a-Librarian chat found on the Libraries’ homepage: www.umanitoba.ca/libraries.

**Section (b) sample:** re: A statement regarding mental health that includes referral information:

**For 24/7 mental health support, contact the Mobile Crisis Service at 204-940-1781.**

**Student Counselling Centre**
Contact SCC if you are concerned about any aspect of your mental health, including anxiety, stress, or depression, or for help with relationships or other life concerns. SCC offers crisis services as well as individual, couple, and group counselling. [Student Counselling Centre: http://umanitoba.ca/student/counselling/index.html](http://umanitoba.ca/student/counselling/index.html)
474 University Centre or S207 Medical Services
(204) 474-8592

**Student Support Case Management**
Contact the Student Support Case Management team if you are concerned about yourself or another student and don’t know where to turn. SSCM helps connect students with on and off
campus resources, provides safety planning, and offers other supports, including consultation, educational workshops, and referral to the STATIS threat assessment team.

**Student Support Intake Assistant**  
520 University Centre  
(204) 474-7423

**University Health Service**  
Contact UHS for any medical concerns, including mental health problems. UHS offers a full range of medical services to students, including psychiatric consultation.  
*University Health Service*  
http://umanitoba.ca/student/health/  
104 University Centre, Fort Garry Campus  
(204) 474-8411 (Business hours or after hours/urgent calls)

**Health and Wellness**  
Contact our Health and Wellness Educator if you are interested in peer support from Healthy U or information on a broad range of health topics, including physical and mental health concerns, alcohol and substance use harms, and sexual assault.  
*Health and Wellness Educator*  
https://umanitoba.ca/student/health-wellness/welcome-about.html  
britt.harvey@umanitoba.ca

**Live Well @ UofM**  
For comprehensive information about the full range of health and wellness resources available on campus, visit the Live Well @ UofM site:  
http://umanitoba.ca/student/livewell/index.html

**Section (c) sample:** re: A notice with respect to copyright:

> All students are required to respect copyright as per Canada’s *Copyright Act*. Staff and students play a key role in the University’s copyright compliance as we balance user rights for educational purposes with the rights of content creators from around the world. The Copyright Office provides copyright resources and support for all members of the University of Manitoba community. Visit [http://umanitoba.ca/copyright](http://umanitoba.ca/copyright) for more information.

**Section (d) sample:** re: A statement directing the student to University and Unit policies, procedures, and supplemental information available on-line:

**Your rights and responsibilities**

As a student of the University of Manitoba you have rights and responsibilities. It is important for you to know what you can expect from the University as a student and to understand what the University expects from you. Become familiar with the policies and procedures of the University and the regulations that are specific to your faculty, college or school.

The *Academic Calendar* [http://umanitoba.ca/student/records/academiccalendar.html](http://umanitoba.ca/student/records/academiccalendar.html) is one
important source of information. View the sections University Policies and Procedures and General Academic Regulations.

While all of the information contained in these two sections is important, the following information is highlighted.

- If you have questions about your grades, talk to your instructor. There is a process for term work and final grade appeals. Note that you have the right to access your final examination scripts. See the Registrar’s Office website for more information including appeal deadline dates and the appeal form http://umanitoba.ca/registrar/

- You are expected to view the General Academic Regulation section within the Academic Calendar and specifically read the Academic Integrity regulation. Consult the course syllabus or ask your instructor for additional information about demonstrating academic integrity in your academic work. Visit the Academic Integrity Site for tools and support http://umanitoba.ca/academicintegrity/ View the Student Academic Misconduct procedure for more information.

- The University is committed to a respectful work and learning environment. You have the right to be treated with respect and you are expected conduct yourself in an appropriate respectful manner. Policies governing behavior include the:

  Respectful Work and Learning Environment  
  http://umanitoba.ca/admin/governance/governing_documents/community/230.html

  Student Discipline  
  http://umanitoba.ca/admin/governance/governing_documents/students/student_discipline.html and,

  Violent or Threatening Behaviour  
  http://umanitoba.ca/admin/governance/governing_documents/community/669.html

- If you experience Sexual Assault or know a member of the University community who has, it is important to know there is a policy that provides information about the supports available to those who disclose and outlines a process for reporting. The Sexual Assault policy may be found at:  
  http://umanitoba.ca/admin/governance/governing_documents/community/230.html  
  More information and resources can be found by reviewing the Sexual Assault site http://umanitoba.ca/student/sexual-assault/

- For information about rights and responsibilities regarding Intellectual Property view the policy https://umanitoba.ca/governance/sites/governance/files/2021-06/Intellectual Property Policy - 2013_10_01 RF.pdf

For information on regulations that are specific to your academic program, read the section in the Academic Calendar and on the respective faculty/college/school web site.
Contact an Academic Advisor within our faculty/college or school for questions about your academic program and regulations [http://umanitoba.ca/academic-advisors/](http://umanitoba.ca/academic-advisors/)

**Student Advocacy**

Contact Student Advocacy if you want to know more about your rights and responsibilities as a student, have questions about policies and procedures, and/or want support in dealing with academic or discipline concerns.
520 University Centre
204 474 7423
student_advocacy@umanitoba.ca