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Syllabus

Introductory Plant Genomics PLNT4310

(Winter 2022)

Faculty of Agricultural and Food Sciences



UNIVERSITY
OF MANITOBA

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COURSE DETAILS

Course Title & Number:	Introductory Plant Genomics
Number of Credit Hours:	3
Class Times & Days of Week:	11:30 am-12:20 pm, Mondays, Wednesdays and Fridays Online UM Learn Webex Lab class 2:30 pm - 5:25 pm Tuesday Online UM Learn Webex
Pre-Requisites:	N/A

Instructor Contact Information

Instructor(s) Name:	Anjan Neupane
Preferred Form of Address:	Anjan
Office Hours or Availability:	Friday 1.00-2.30PM or as requested
Office Phone No.	204-583-0999 (cell for urgent issue)
Email:	neupanea@myumanitoba.ca or anjan.neupane@umanitoba.ca Emails will be answered as time permits on week days (usually within 24 hours)
Contact:	Email is the preferred method of contact and virtual meetings can be set up where applicable
Lab Instructor/ TA:	Keval Shah (Email: shahk34@myumanitoba.ca)

COURSE DESCRIPTION

U of M Course Calendar Description

An introduction to basic technologies in plant genomics. Topics include DNA sequencing, molecular marker detection, genome sequencing, gene expression analysis, gene mapping and functional analysis. A laboratory will provide hands-on experience with several genomic techniques through online demonstration.

General Course Description

Plant genomics is a relatively new biological science and relevant to many conventional biological sciences such as physiology, genetics, biochemistry, biology, pathology, and plant breeding. In this field, many new technologies such as high throughput molecular marker detection, DNA sequencing, RNA and protein analysis have been developed. Plant genomics focuses on the structure, function, and evolution of whole genomes of plant species. Plant genomics deals with the whole genome as well as individual genes, their interaction and network. Functional genomics is the cornerstone in genomics and helps understanding reproduction, adaptation, and evolution of living organisms. Plant genomics offers the advanced technologies in plant science and is applied in a dozen of related fields such as plant physiology, genetics, pathology, and plant breeding. Plant genomics focuses on the latest progress in plant science. To have the students catches up with the contemporary technologies in agriculture, plant genomics offers the opportunity to understand and extend new technologies in applied fields in agriculture.

Course Goals

Students who will pursue careers in biological sciences and have interests in plant genomics or related research topics should take this course. Lectures, presentations and discussions allow students to learn the new technologies in molecular marker development, detection and applications; to update the latest progress in genome science, especially genome sequencing, genome feature and evolution; to know the major tools in gene functional analysis; and to understand the gene functions in plant development, reproduction and various metabolite pathways; to describe the mechanism of novel genome editing tools such as CRISPR-CAS9 technology and their applications; to understand the importance of gene cloning and identification.

Course Learning Objectives

These learning outcomes areas include: Students will be able to use critical thinking skills to understand the advance technology in plant genomics, to create hypotheses and describe the approaches to test these hypotheses in genomics, to understand the knowledge of plant genomics that promotes agriculture and benefits the society. Students will become competent by learning relevant knowledge, experience and skills in plant genomics. Their knowledge in plant genomics will help them engage in solving social problems and understand social concerns about new technology. Students will improve their communication and language skills that help them extend new technology to agriculture and agri-food business and industry. Students will gain skills in time managements and organization, improve their ability to work together and respect their peers, showing their positive attitudes to themselves and others, to be eager to serve the society and make contributions by using their knowledge in plant genomics and agriculture.

COURSE MATERIALS AND TECHNOLOGY

There is no selected textbook for this course. Students can follow any book related to genetics, genomics, and molecular biology. A list of reference book chapters and journal articles is available, and all references can be accessed through UM library links. Related research articles will be provided to students. Be aware of copyright laws when using readings. Note: In your presentation and term paper, proper citation format (e.g., APA, MLA, Chicago, IEEE, etc.) should be used.

UMlearn will provide primary access to course materials Cisco-Webex will be the software used for synchronous classes.

EXPECTATIONS AND POLICIES

I expect students to attend class, involve in class discussion. Students should be ready and active to learn. They should have the relevant background of knowledge for fully understanding the content in this course. Students are encouraged to do more reading of selected publications in plant genomics. I will treat you with respect and would appreciate the same courtesy in return.

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 the information on website of the University of Manitoba, Online Academic Calendar, Undergraduate and Graduate).

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

COURSE 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](#).

Lectures topics to be covered include:

- I. **Introduction and concepts on Genomics**
 - History and development in genomics
 - DNA, chromosomes, and genome
 - Mendel's law
- II. **Review on molecular markers**

- Molecular marker technologies
 - SNP marker and detection
 - Genetic map construction
- III. Forward genetics**
- Gene mapping
 - QTL mapping
 - Genome wide association studies
- IV. Gene based cloning**
- Fine mapping
 - Positional gene cloning
- V. Review on Genome science**
- Sequencing technologies
 - Sanger and Illumina sequencing
 - Genome library and sequencing
- VI. Genome science project**
- Genome annotation
 - Major plant genome
- VII. Student presentation and discussion I**
- Forward genetics
 - Genome sequencing technologies
 - Plant genome project
- VIII. Student presentation and discussion II**
- Reverse genetics
 - Gene expression
 - Plant genome editing
- IX. Reverse genetics**
- Concepts in functional genomics and reverse genetics
 - Enzymes, vectors
 - Mutation and gene silencing
 - RNAi Gene silencing, TILLING, VIGS
- X. Gene expression**
- Quantitative polymerase chain reaction
 - Plant transcription
 - Expression profiling
 - RNA sequencing
- XI. Gene editing**
- Introduction, concepts and uses
 - Plant transformation
 - Genetically modified (GM) crops
 - Genome editing tools
 - CRISPR-cas9 technology
- XII. Application of plant genomics**
- Plant improvement using genomics tool
 - Recent research and advances in plant genomics
 - Regulatory constraints
 - Final discussion

Lab schedules

Date	Topic
Jan 25	Lab introduction
Feb 1	High throughput plant DNA extraction
Feb 8	Polymerase Chain Reaction (PCR)
Feb 15	Agarose Gel Electrophoresis
Feb 23	Reading week
Mar 1	Command line in genomics
Mar 8	Mapping of genetic data
Mar 15	Introduction to Python
Mar 22	Python programming
Mar 29	Visualization of data using R-studio
April 5	Discussion on genomics lab Lab report due

Voluntary Withdrawal

Voluntary withdrawal deadline is April 25, 2022. Refer to the [Registrar's Office](#) web page for more information.

I am willing to discuss with individual students their progress and attempt to provide strategies for improvement prior the withdrawal date.

Important date

Jan 24	First day of classes
Feb 4	Registration revision VW date
Feb 22-25	Winter Term break
April 15	Good Friday
April 25	VW deadline and last day of class
April 26-May 3	Final exam period

COURSE ASSESSMENT

ASSIGNMENT DESCRIPTIONS:

Assignment I Genomics terminology and summary writing

Assignment II Linkage mapping and QTL analysis (group project)

Assignment III Student presentation on techniques and application of genomics

Assignment IV Plant genomics application

TITLE: Details of assignment will be provided in class and UM learn

GOAL: This assignment is going to evaluate how you understand the course content and synthesize the relevant information in a scientific manner

PROCEDURE/ EVALUATION CRITERIA: Details of assignment will be provided in class and UM learn

SUBMISSION GUIDELINES: via UM learn

Student presentation

Details of student presentation and evaluation method will be provided in class and UM learn

Assignment Feedback

Assignments will be graded, and student feedback will be provided based upon the assessment Criteria in one week.

Assignment Extension and Late Submission Policy

Assignments will be provided with instruction and due date, i.e. generally provides two weeks. Any assignment extension should be requested. Without extension permission, late submission will result in deduced grade.

Course Evaluation Methods

Activities/Exam	Assessment	Date	Value of final grade
Assignment 1	Instruction: 1 st week of class	Due on Feb 18	10%
Assignment 2	Instruction: Feb 2 nd week	Due on March 2	10%
Assignment 3: Student presentation	Instruction: March 1 st week	During class March 15-30	20%
Assignment 4	Instruction: April 1 st week	April 18	10%
Class participation and discussion	Full term		10%
Final exam	Comprehensive exam	Final exam week	20%
Lab participation and Lab report	Refer to TA instruction		20%

Grading

Letter Grade	Percentage out of 100	Grade Point Range	Final Grade Point
A+	95-100	4.25-4.5	4.5
A	86-94	3.75-4.24	4.0
B+	80-85	3.25-3.74	3.5
B	72-79	2.75-3.24	3.0
C+	65-71	2.25-2.74	2.5
C	60-64	2.0-2.24	2.0
D	50-59	Less than 2.0	1.0
F	Less than 50		0

Referencing Style

Assignments should use the APA reference style as outlined in the text:

American Psychological Association. (2009). Publication manual of the American Psychological Association (6th ed.). Washington, DC: Author

LEARNER SUPPORT

Instructors shall provide to every student the information on university support offices and policies in [Schedule "A"](#) within the first week of classes.

Schedule "A"

Section (a) A list of academic supports available to Students

Writing and Learning Support

The Academic Learning Centre (ALC) offers writing and learning supports to help you throughout your academic program. These supports are offered online during the Covid-19 pandemic.

Make an appointment with an ALC 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. The ALC also has an English as an Additional Language (EAL) specialist available to work with students on improving their English-language academic writing skills.

Consult an ALC learning specialist or attend an academic skills workshop to improve your time management, learning strategies and test-taking strategies. Get support in select courses by making an appointment with an ALC content tutor. The ALC also offers peer-facilitated study groups called Supplemental Instruction (SI) for certain courses that students have typically found difficult. In SI study groups, students ask questions, compare notes, discuss content, solve practice problems, and develop new study strategies in a group-learning format.

In addition to one-to-one and group sessions, you can also find writing and study tip sheets and videos on the ALC website.

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/>

Contact the Academic Learning Centre by calling 204-480-1481 or emailing academic_learning@umanitoba.ca. Bannatyne students can contact the Bannatyne Student Services office at 204-272-3190.

University of Manitoba Libraries (UML)

Research begins at [UM Libraries](#). [Learn at the Libraries](#) is a great place to start, with information for students on academic writing, how to search the library, evaluating resources, and writing citations. 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 locating appropriate resources or managing citations, 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 online. When working remotely, students can also receive help online through [Ask Us!](#) chat. For further detail about the libraries' services and collections, [visit the Libraries' web site](#). Regularly check our [COVID-19 Update](#) page for available library services and access to resources for Fall 2020

Section (b) 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>

474 UMSU University Centre or S211 Medical Services Building

(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.

<http://umanitoba.ca/student/case-manager/index.html>

520 UMSU University Centre

(204) 474-7423 (Student Support Intake Assistant)

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. Note that due to fire displacement, UHS is unable to provide in-person medical care on the Fort Garry Campus until October, 2020.

University Health Service <http://umanitoba.ca/student/health/>

(204) 474-8411 (Business hours or after hours/urgent calls)

Health and Wellness

Contact our Health and Wellness Educator if you are seeking information on health topics, including physical and mental health concerns, alcohol and substance use harms, or sexual violence. You can also access peer support from a *Healthy U* peer health educator.

Health and Wellness Educator

<https://umanitoba.ca/student/health-wellness/welcome-about.html>

britt.harvey@umanitoba.ca

469 UMSU University Centre

(204) 295-9032

Sexual Violence Resource Centre

Contact SVRC if you have experienced sexual violence or are seeking information about how to help somebody else. SVRC provides inclusive, survivor-centred, trauma-informed services, such as consultation, referrals, safety planning, and a range of on-site supports, including counselling by Klinik.

Sexual Violence Resource Centre

<https://umanitoba.ca/student-supports/sexual-violence-support-and-education>

svrc@umanitoba.ca

537 UMSU University Centre

(204) 474-6562 (Sexual Violence Intake and Triage Specialist)

Student Services at Bannatyne Campus

Contact SS@BC to access a full range of resources and supports for learners at the Rady Faculty of Health Sciences. Services are provided through a one-stop hub that includes a range of supports for personal and academic success, including counselling, mental health consultation, and spiritual care.

Student Services at Bannatyne Campus

<https://umanitoba.ca/student-supports/student-services-bannatyne-campus>

bcss@umanitoba.ca

S211 Medical Services Building

(204) 272-3190 (Intake and Triage Specialist)

Section (c) 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> for more information.

Section (d) 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 to 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:

http://umanitoba.ca/admin/governance/governing_documents/community/235.html

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

<http://umanitoba.ca/faculties/>

Contact an **Academic Advisor** within our faculty/college or school for questions about your academic program and regulations <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.

<http://umanitoba.ca/student/advocacy/>

520 University Centre

204 474 7423

student_advocacy@umanitoba.ca

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/> or contact um_copyright@umanitoba.ca.

Note: You hold the copyright to all of your course material that you prepare and present. Course materials (both paper and digital) are for the participant's private study and research and should not be shared.