

MBIO 3410 Molecular Biology- Fall term 2022

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Lecture Time and Room: 10:00 am - 11:15 am T/TH – 172 AGRICULTURE

Office Location and Hours: Rm. 203 Buller or remote via zoom by appointment.

Lecture: Course content will be delivered as in-person lectures. There will be no video lectures of missed lectures. PowerPoint notes will be available for download. Students are expected to attend all scheduled classes unless ill. It is your responsibility to catch up on the missed lecture material and notes.

Textbook: There is no required textbook, but Analysis of Genes and Genomes by R.J. Reese (2004) is a good resource and is listed as an optional book for the course. Students also greatly benefit from exploring the Science Library or text books you have used in other courses, such as Biochemistry books (e.g. Lehninger's Biochemistry) and Genetics texts (such as Russell's iGenetics), Karp's Cell and Molecular Biology text (recent editions) or "Genes" by B. Lewin (editions VI and beyond); all these books provide excellent background reading. Explore and actively learn. Students are expected to attend lectures, but they are just the beginning of understanding.

Minimum technological requirements:

- A computing device where one can create and edit documents
- An internet connection capable of streaming videos and downloading software
- Access to a web-cam and microphone.

Course Description:

The overall goal of the course is to introduce you to the major principles of molecular biology, as they apply to both prokaryotic and eukaryotic life. The **major** topics to be covered are listed below. Chapters refer to "Analysis of Genes and Genomes"; but keep in mind that additional material will be presented in the lectures and **you are responsible for everything that is covered in class!**

Please note: That the content order is likely to change and this is not an exhaustive list. In fact it is common to expand on an area as it comes up.

- I. Introduction to Nucleic Acids, review of their biochemistry and features relevant to understanding molecular genetics/biology. (Chapters 1 and 2)**
Biochemistry of RNA and DNA; transcription/translation, genetic code, gel electrophoreses, topology; effect of pH, temperature and ionic strength on nucleic acids;
- II. Principles of DNA and RNA based technology. (Chapters 2, 3, 4, 5, parts of 7 and 9)**
Restriction enzymes, physical mapping, DNA polymerases; PCR (RT-PCR and qRealTimePCR), DNA sequencing – Sanger, various "next gen sequencing" (Pyrosequencing, Illumina etc., massive paralleled sequencing), genome sequencing; metagenomics, transcriptomics, proteomics
- III. Recombination and mobile elements (last segment of Chapter 1)**
Models for the recombination process. Relationship between recombination and genome maintenance (repair and gene conversion); site-specific recombination and mobile elements (insertion elements, transposons, retroelements);
- IV. Genes to Genome: Eukaryotic and Prokaryotic Chromosomes, Chromatin, Nucleosomes, Genes, Introns and Exons, mRNA processing, rRNA processing, repetitive DNA, mobile elements – group I and II introns, inteins;**

simple and complex multi-gene families, gene numbers and gene amplification, Genomes and "chromosomal landscapes";

V. Prokaryotic and Eukaryotic gene Expression (Chapter 1)

RNA polymerases; initiation, termination, and regulation of transcription; promoters and enhancers; transcription factors etc.; post transcriptional regulation strategies; riboswitches; mRNA surveillance; RNAi; introduction to PCR and RACE and footprinting;

VI. Principles of gene manipulation technology. B. Cloning vectors; enzymes needed in biotechnology; expression vectors, reporter genes, and "suicide vectors"; RACE and DNA footprinting; CRISPR

VII. Transgenesis: expression of foreign genes in prokaryotic and eukaryotic systems. (Chapters 11 and 12; if time permits)

Gene replacements, knock-outs and knock-downs.

Genetic manipulation of yeast, plants and mammalian model systems.

Evaluation:

Component	Date	Contribution to Final Grade	Feedback
Assignment #1: Introduction to Pub med	Due September 30 th	5%	On UMLearn
Quiz	Tentatively October 10 th -16 th	15%	On UMLearn
Assignment # 2 Genbank and BLAST	October 28 th	10%	Marked and uploaded
In Class Midterm	November 3 rd	30%	marked and Returned
Final exam	To be determined by Registrar's Office	40%	Final Grade

Please note that specific assignment instructions will be provided as appropriate.

The grades for the midterms will be returned prior to the **voluntary withdrawal date** (November 22, 2020).

Letter grades are assigned taking into consideration the grade distribution in the class and the University of Manitoba's descriptors A⁺ (Outstanding), A (Excellent), B⁺ (Very Good), B (Good), C⁺ (Satisfactory), C (Adequate), D (Marginal), F (Failure); see <http://umanitoba.ca/student/records/grades/686.html>

For this course, **a grade of 45% in the final exam is required to pass the class.** The grading scheme generally, but not always, is that used by the Rady College of Medicine

https://umanitoba.ca/faculties/health_sciences/medicine/admissions/8847.html.

A+ (>95.9), A (85-94.9%), B+ (80-84.9%), B (70-79.9%), C+ (65-69.9%), C (60.0-64.9%), D (50-59.9%), F (<50% total, or <45% in final exam).

There are no deferred Midterm exams. If you miss an in-class test, the marks automatically will be added to the final exam. Medical or other notes are not required for in-class tests. The **Final examination** will be comprehensive (i.e., cover all lectures), and will be scheduled by Student Records during the December examination period. Permission to write a deferred final exam is granted by your Faculty - the instructor is not involved in this process. If it is necessary for you to write your final exam at an alternate date, you must contact your Faculty office with appropriate documentation to request permission for a deferred exam. This is a **strict** university policy, and there are no exceptions. If a deferral is granted it is your responsibility to contact the instructor as soon as possible for the date of the deferred exam.

As per University of Manitoba policies, students are not permitted to access any unauthorized materials during an examination. This includes but is not limited to books, notes, or any electronic device capable of wireless communication and/or storing information.

How to succeed in your science courses?

The Faculty of Science is committed to delivering the high-quality education our students have come to expect. We also want to ensure that you set yourself up for success. We want you to succeed!

#1. Registration Revision Period: Use the Registration Revision Period to evaluate course syllabus. During the registration revision period you will be able to drop/add courses without any financial consequence. Speak directly with instructors if you have any questions specific to their course.

#2. Evaluate Workload: Take time to consider the workload associated with the course schedule you are planning. Be realistic about other commitments and distractions that are part of everyday life and make your course selection decisions accordingly. Please consider watching this presentation from the Academic Learning Centre for Managing Your Time Effectively. If you want to discuss anything, talk to an Academic advisor in your faculty – Academic advising.

#3. Commitment to Study: For an average course, you should aim to commit at least three hours of studying for every hour of lecture. Make sure you keep up with studying on a consistent basis.

#4. Reach Out for Help: If you experience issues learning the course material, reach out to your instructor, teaching assistants, supplemental instruction leaders or Academic Learning Centre for the course as soon as possible. Most content builds on previous content and deficiencies in understanding will cascade issues throughout the course. For questions about your degree program or if life stresses hinder your academic performance, contact your faculty's academic advisors immediately.

#5. Learn Efficiently, Learn to Take Notes: During the pandemic, many lectures were delivered asynchronously so students had a chance to review lecture videos when they did not catch something during the lecture. Lectures are delivered in-person this fall term therefore students will not have the luxury of rewatching a live lecture. Therefore, you may want to review some note-taking tips offered by the Academic Learning Centre which can help you learn efficiently.

LEARNER SUPPORT

Writing and Learning Support

The Academic Learning Centre (ALC) offers writing and learning supports to help you throughout your academic program. 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.

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.

MENTAL HEALTH SUPPORT

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

520 University Centre, Fort Garry Campus
(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

469 University Centre, Fort Garry Campus
(204) 295-9032

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>

HEALTH AND SAFETY

The University of Manitoba (the "UM") is committed to maintaining a safe learning environment for all students, faculty, and staff. Should campus operations change because of health concerns related to the COVID-19 pandemic or other campus-wide emergency, it is possible that this course will move to a fully remote delivery format. Should the instructor be required to stay at home for an extended period and an alternate instructor not be available, the course may move temporarily to a remote delivery format.

Mask Wearing

In a face-to-face environment, our commitment to safety requires students to observe all Covid guidelines set by the University (<https://umanitoba.ca/coronavirus>) While on campus and in class, you must wear masks as stipulated in current University policies, procedures, and guidelines. The University highly recommends the use of KN-95 masks; the minimum requirement is a ATSM Level 2 Medical mask. Both mask types are available at many locations on campus.

Students who fail to comply are subject to disciplinary action in accordance with the Student Discipline Bylaw and the Non-Academic Misconduct and Concerning Behaviour Procedure.

If you do not follow masking requirements, you will be asked to leave the learning space and may only return to the class already in progress when you have complied with this requirement. Repeated issues will result in disciplinary action as previously noted.

Students should not eat or drink during class time.

Illness

Remember: **STAY HOME IF YOU HAVE SYMPTOMS OR ARE ILL.** If you become ill, we highly recommend that you self-isolate; you should notify your instructor by email so you can develop a plan to complete the course learning outcomes while you are absent.

What to do if you become ill while at UM:

1. Leave the classroom, lab, or workspace immediately. Continue to wear your mask while leaving the premises and/or while waiting for transportation.
2. Perform hand hygiene (soap and water or hand sanitizer) and avoid contact with others and minimize contact with the physical environment.
3. Once at home, complete the MB self-assessment and follow the directions that are provided.
4. Inform your instructor(s) or, if in residence, the appropriate individual. The Instructor will discuss with you arrangements for extensions, deferrals or make-up assignments as required.
5. Please remain off-campus and all UM facilities until cleared to return in accordance with self-assessment, testing results, and UM recommended isolation procedures.
6. Complete the COVID-19 case reporting form

Recommended transportation options (in order):

1. Drive yourself home.
2. Pick-up by family or friend – remember to keep your mask on and to distance yourself as much as possible, and where possible, open a window to improve ventilation.
3. Pickup by taxi/Uber:
 - Remain masked and perform hand hygiene before entering the vehicle.
 - o Avoid touching the inside of the vehicle
 - o Keep your mask on for the duration of the ride
 - o Where possible, open a window to improve ventilation.
4. Winnipeg Transit buses – We recommend that you do not use Winnipeg Transit in this situation.

ACADEMIC ACCOMMODATIONS

Students who have, or think they may have, a disability (*e.g.*, mental illness, learning, medical, hearing, injury-related, visual) are encouraged to contact Student Accessibility Services to arrange a confidential consultation. Instructors are notified by Student Accessibility Services what accommodations their registered students require which will help the instructor determine fair, feasible and reasonable academic accommodations without compromising academic standards. This takes time and planning, so reach out at the start of term.

SAS students can write their exams and tests in spaces organized by the SAS Exam Centre however they must register with the SAS Exam Centre a few weeks in advance. Please be sure to do so to receive the accommodations.

Medical Notes and Other Documentation

The Self-Declaration for Brief and Temporary Absences Procedure and Policy will be effective on September 1, 2022 and therefore students will not be required to present medical or other documentation for absences due to extenuating circumstances of 72 hours or less, however this form must be completed and submitted to the instructor in lieu of the documentation. Please note that further documentation may be requested from students who claim multiple temporary absences or absences for more than 72 hours.

Short-Term Academic Accommodations (up to 72 consecutive hours absences)

As we emerge from the pandemic, the University still has the health and safety of its community at top of mind. Since your classes are held in-person, please make sure you follow the University's COVID-19 Health and Safety Protocols. Notably, exercise good hand hygiene, stay home if you are ill and you must wear a mask when attending lecture/labs and on campus.

- Students who miss a lab or assessment due to an extenuating brief or temporary absence should complete a self-declaration for brief and temporary student absences form and submit it to their instructor **within 48 hours of the end of the brief absence**. The instructor will discuss with the student how the missed work can be made up.
- **Students absent for over 72 hours as a result of medical, compassionate, University scholastic, University athletic or religious event will require official documentation to explain the absence.** Students should reach out to instructors early if absences are anticipated.
- **Personal vacations and work requirements are not considered acceptable absences.**

Long-Term Academic Accommodations

Students with long-term academic accommodations are usually registered with Student Accessibility Services. The long-term academic accommodations are usually to accommodate long term physical or mental illness and accommodations can be in the form of notetaking, interpreting, assistive technology, and assessment accommodations.

Final Exams

Students who have conflicting scheduled exams should contact their faculty's academic advisors as soon as possible. Students who miss their exam due to extenuating circumstances can apply for a deferred exam. Please note that the granting of a deferred exam is not necessarily guaranteed.

Missed Lecture Notes

Students missing lecture notes as a result of absences are responsible for obtaining the missed content on their own accord. Contact a classmate or the course instructor for their notes but please be aware the instructor is not obliged to create notes for students as a result of absences.

VOLUNTARY WITHDRAWAL (VW) AND AUTHORIZED WITHDRAWAL (AW) POLICIES

VW: Students have the opportunity to voluntarily withdraw (VW) from this class up to November 22 (in the event of date discrepancies, please follow the dates on the Important Dates and Deadlines webpage). By then, you will have received feedback to allow you to assess your progress and determine if you are achieving the grade you are aiming for in this course. If you are unlikely to be successful in the course, or not achieving the grade that you are aiming for, you should consider a VW from the course. You should contact your instructor to review your progress in more detail, or you may discuss the VW option with a Faculty academic advisor. Students enrolled in the course after the VW deadline will be assigned a final grade.

AW: At times medical or compassionate circumstances arise in a student's life that prevent them from performing as they would in normal circumstances. If you are in this position, please contact a Faculty academic advisor to discuss your options. Be prepared to provide documentation, which supports your situation.

PROFESSIONAL CONDUCT

Students in the University community can freely express their thoughts, opinions, and beliefs however they must observe the Respectful Work and Learning Environment Policy and treat each other, staff, and faculty with respect. Students who are alleged to have breached the Respectful Work and Learning Environment Policy will be investigated and disciplined according to the Student Non-Academic Misconduct and Concerning Behaviour Procedure.

ACADEMIC INTEGRITY

Academic integrity is taking responsibility for and being honest with your work and respecting the work of others. Since you are a member of the university community, we want you to learn what that responsibility and honesty entails and how we respect the work of others.

The Faculty of Science continues to uphold high standards of academic integrity. We know that you, our students, support us in this and we count on every one of you to do your part. We expect all students to strictly adhere to

instructions from their professors regarding what resources can and cannot be used for assessments, to follow other rules the professors wish to set, and to adhere to the academic conduct standards of the University and Faculty.

To aid professors in assuring that all forms of assessments have been administered fairly, the University will be electronically monitoring all tests, quizzes and examinations, included, but not limited to overseeing chatrooms, relevant predatory websites and, in so doing, we will analyze scholastic evidence of individual exams.

Students who transgress academic integrity rules will be investigated and disciplined (if justified) according to the Student Discipline By-Law and Student Academic Misconduct Procedure.

The list of suggested minimum penalties assessed by the Faculty of Science for acts of academic dishonesty is available on the Faculty of Science website.

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.

Please respect copyright. We will use copyrighted content in this course. No audio or video recording of the lectures is allowed in any format, openly or surreptitiously, in whole or in part without permission from the instructor. University guidelines state that copyrighted works, including those created by the course instructor, are made available for private study and research, and must not be distributed in any format without permission. Since it is illegal, 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>.

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 is one important source of information. View the sections of *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, Student Discipline and, Violent or Threatening Behaviour

- 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 Violence** policy may be found at: <https://umanitoba.ca/governance/governing-documents/governing-documents-university-community#sexual-violence>. 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/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 **YOUR** registered 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