

**Instructor Name: Georg Hausner**

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**TA support for Assignment (TBA)**

Textbooks and other required materials: No text book, course materials on UMLearn.

**Course description:****MBIO3430 Molecular Evolution** (Molecular evolution of biochemical processes, genomes, and phylogenetics, applications to medicine, biotechnology, anthropology, biology and history).**Prerequisite(s): one of MBIO 2020, (=MBIO 2110) (Molecular Biology 3410 highly recommended)** Genetics I, Cell Biology or Biochemistry II.

Students are expected to review all material covered in videos and/or classes (posted on UMLearn).

**For Jan. 25<sup>th</sup> to Feb. 17<sup>th</sup>/2022 the course is conducted online.****NOTE:** There could be the potential for a temporary pivot to online teaching (for example due to instructor illness). **PLEASE check “UMLearn Announcements” with regards to updates on the course.****NOTE:** There is a “masking mandate” for attending lectures.**Course material:** Lecture material (ppt files and if available videos) can be found online (UMLearn). Course may use several platforms for delivery: “in person” or if necessary “online” such as Zoom/videos. Misuse of course material will result in the removal of all materials from the course site. Ultimately this course is presented Life and/or online (this depends on the University of Manitoba guidelines on course delivery) via Videos (UMLearn) and it is the student’s responsibility to “attend” the lectures (recordings) and view the videos (UMLearn) as they become available. **Pay attention to the “announcements” on UMLearn to stay up to date on the course materials and remainders on deadlines.**

Evaluation Component	Date	Contribution to Final Grade	Feedback
Midterm exam 75 min – (multiple choice and true/false type questions).	<b>March. 17<sup>th</sup>/2022</b>	30	Scores provided as soon as available
Assignment	<b>Part 1: submit online - March 3rd/2022</b>	5	Evaluated copies Posted online
	<b>Part 2: submit online - April 19<sup>th</sup>/2022</b>	15	(UMlearn) by end of term.
Final exam	<b>To be set by Registrar's office (2 hours)</b>	50	Final Grade

Please note that specific assignment instructions will be provided as appropriate. The grades for the Midterm Exam will be returned prior to the **voluntary withdrawal date (Apr. 25th/2022)**.

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 (Adequate), D (Marginal), F (Failure); see <http://umanitoba.ca/student/records/grades/686.html>  
**The norm for this course with regards to conversion of % to letter grades is as follows: A+ (>90%), A (80-89.9%), B+ (75-79.9%), B (70-74.9%), C+ (65-69.9%), C (60.0-64.9%), D (50-59.9%), F (<50%, or <50% in final exam\*).**

**Please note:**

**A passing final grade (D or above)** in this course requires that the student **passed the final exam (> 50 %)**; also, a final total grade (midterm, plus assignment, plus final exam) of below 60 % is viewed as marginal (i.e., D) and a **total grade below 50 % is a failure (F)**. There are no supplementary exams or assignments.

**Note: No make-up midterms\*.** The final exam will be 80 % for those where the midterm exam was missed. However **late assignments will NOT be accepted and missed assignments will be scored as 0 marks.**

\*due to challenges with scheduling times and space, and generating alternative midterm exams that are fair to the individual and the class.

The Mid-term examination will be held during the regular scheduled class period. The **Final examination** will be comprehensive (i.e., covers all lectures), and will be scheduled by Student Records during the April/May examination period. **Permission to write a deferred final exam is granted by your home faculty** - the instructor is not involved in this process. If it is necessary for you to write your final exam at an alternate date please contact your home faculty. This is a **strict** university policy, and there are no exceptions. If a deferral is granted it is your

responsibility to contact the instructor immediately for the date of the deferred exam, missing the deferred exam will result in a grade of F.

Students requiring accommodations are directed to Student Accessibility Services to facilitate the implementation of accommodations. Course instructors are willing to meet with Students to discuss the accommodations recommended by Student Accessibility Services.

**Academic dishonesty** guidelines are stated in your calendar regarding University policy with respect to academic dishonesty (particularly plagiarism and cheating) and behaviour and absence from final exams. All work is to be completed independently unless otherwise specified. Please remember that group projects are subject to the rules of academic dishonesty and every group member must ensure that a group project adheres to the principles of academic integrity.

The Faculty of Science web page has detailed information:

<https://www.sci.umanitoba.ca/undergraduate-students/academic-resources/academic-integrity-2/>.

Please read and follow these guidelines, and ask if you have any questions.

**Topics covered (please note topics may be covered in a different order as listed):**

**1. Introduction: Evolution of the HIV virus, Bird Flu and Covid-19 (emerging diseases)  
(i.e., Why should you care about Molecular Evolution?)**

**2. Molecular origins of life (Ideas and concepts)**

From organic molecules to self-replicating systems

“Genetic takeover”; Ribozymes and the RNA world

Carl Woese and the three domains of life (and updates: two domains?)

“Universal tree of life”; Origin of the organelles;

The “first gene”: “exon theory” introns and exons; The “first cell”

-----Topics 1 and 2 make up about ~ 40% of the course-----

**3. Introduction to phylogenetics (includes material covered by the Assignment#)**

Changes in nucleotide and amino acid sequences

Molecular data and phylogenetic trees (MEGA-X#)

*\*Molecular markers and application to evolutionary/ecological studies*

**4. Basic concepts of Evolution**

(Review of “Basic concepts of Evolution”)

Selection and “fitness”

The “modern synthesis” and the “Neutral theory of Evolution”

Micro (example evolution of *Homo sapiens*) and Macro Evolution

Evolution of antibiotic resistance in bacteria, [Evolution in the test tube (phages and

bacteria),—Human evolution [mitochondrial DNA and Y chromosomes plus

“ancient” DNA (genomics) analysis];

Mechanisms of Speciation; EvoDevo: Gradualism vs punctuated evolution

**5. Genomes and their Evolution**

Repetitive/“selfish” DNA (Mobile elements)

Genome expansion by duplications

Exon shuffling and introns revisited; source of “new” genes

Species concept and speciation revisited: Molecular mechanisms

*\*Concerted evolution (and Molecular Drive) within gene families*

*\*Topics covered if time permits (otherwise will be presented in a condensed version).*

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**Key to success: Attend “lectures” (i.e., that includes viewing videos as they become available), read assigned readings, keep your notes up to date (i.e., soon after a lecture review your notes and add comments, fill in details, organize and integrate the figures from handouts). Part of a University education is to learn how to take notes, organize information, review information; expect to put certain concepts together yourself based on the material presented. Like any course in science dedicate at least a few hours a week for this course or you might find that scrambling your notes together before the exams results in poor performances.**

### **Assignment Overview:**

The assignment requires internet access to web-based resources, as the purpose is to introduce students to some basic bioinformatics tools that are currently available “online”. It requires some effort and patients. Many of these sites/programs are user-friendly and will guide you through the various options available. The actual assignment will be posted on (or before) UM Learn Feb. 10<sup>th</sup>/2022 and an interim report is due March 3rd/2022 (part 1) the final report (part 2) is due - April 19<sup>th</sup>/2022. Start on your assignment as soon as possible, as late penalties apply (10 % per day). The interim report consists of a file showing the necessary data has been collected in the proper format (fasta format and .txt file) along with a short write up (~ 1.5 pages double spaced) that features a title and an introduction. The final report (part 2) will be in the format of a scientific paper, it is due April 19<sup>th</sup>/2022. Details on the format for the write ups will be posted on UMLearn.

You will need to get some basic (free) programs:

**To get Started – download the following: “Build your basic tool box”**

1. Clustal-X <http://www.clustal.org/download/current/> (Win, Linux, or MacOS version)
2. AliView <http://www.ormbunkar.se/aliview/> or <http://www.ormbunkar.se/aliview/#DOWNLOAD>
3. MEGA-X(orXI) <http://megasoftware.net/>

Bookmark the following:

4. PRALINE (protein alignment tool) <http://www.ibi.vu.nl/programs/pralinewww/>
  5. MAFFT (<https://mafft.cbrc.jp/alignment/server/>) [alternative to Clustal-X]
  6. NCBI blast suit of programs <https://blast.ncbi.nlm.nih.gov/Blast.cgi>
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**For information:**

**If you experience depression, anxiety, or other health or stress related issues – you are not alone - please consider the following resources:**

**Student Counselling Centre**

474 University Centre  
University of Manitoba, Winnipeg, MB R3T 2N2 Canada  
Phone: 204 474-8592 Fax: 204 474-7558  
<http://umanitoba.ca/student/counselling/>

**CMHA Manitoba and Winnipeg**

930 Portage Avenue, Winnipeg MB R3G 0P  
E-mail: [office@cmhawpg.mb.ca](mailto:office@cmhawpg.mb.ca)  
<https://mbwpg.cmha.ca/mental-health-resources-for-winnipeg/>

**Klinik Community Health**

870 Portage Avenue  
Winnipeg, MB, R3G 0P1  
Phone: (204) 784-4090  
Admin Fax: (204) 772-7998  
Medical Fax: (204) 784-4013  
<http://klinik.mb.ca>

**First Nations and Inuit Hope for Wellness Help Line**

1-855-242-3310  
Counselling available in English and French - upon request, in Cree, Ojibway, and Inuktitut  
Crisis Response Centre  
817 Bannatyne, Winnipeg; attend in person

**Jack.org**

General information about student mental health, useful for sharing with friends and start the conversation!  
<https://jack.org/Home>  
Phone: 416-425-2494

**Urgent Help**

**University Security Services (24 hs) #555** (from MTS or Roger wireless)  
**On Campus Suicide Crisis Klinik (24 hs) 4-(204) 986-6222**  
**Adult Mobile Crisis Service 204-940-1781**  
**Crisis Stabilization Unit 204-940-3633**  
**Crisis services Canada <http://www.crisisservicescanada.ca/en/>**