Instructor: Dr. Deb Court
Office: 301 Buller
Phone: 204-474-8263
Email address: Deborah.Court@umanitoba.ca
Office hours: usually Monday from 1:30-3:30; in general please contact me to set up a time.
Web Site: UMLearn (https://universityofmanitoba.desire2learn.com/d2l/login

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.

Academic honesty 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 (http://umanitoba.ca/faculties/science/undergrad/resources/webdisciplinedocuments.html). Please read and follow these guidelines, and ask if you have any questions.
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 (note that the order may change). 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 what is covered in class!

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, Probes and Southern hybridization, physical mapping, RFLP and applications, FISH, DNA polymerases; PCR (RT-PCR and qRealTimePCR), DNA sequencing – Sanger, 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 "chromosomol 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

<table>
<thead>
<tr>
<th>Component</th>
<th>Date</th>
<th>Contribution to Final Grade</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-class mini-quiz</td>
<td>Tues., October 3, 2017</td>
<td>6%</td>
<td>Will be marked in class</td>
</tr>
<tr>
<td>In-class quiz</td>
<td>Thurs., October 26, 2017</td>
<td>26%</td>
<td>Returned prior to VW date and discussed in class</td>
</tr>
<tr>
<td>Assignment #1</td>
<td>Thurs., Sept. 28, 2017</td>
<td>3%</td>
<td>On UMLearn</td>
</tr>
<tr>
<td>Prokaryotic ORFs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assignment #2</td>
<td>Tues., Nov. 30, 2017</td>
<td>5%</td>
<td>On UMLearn</td>
</tr>
<tr>
<td>CRISPR and Eukaryotic ORFS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final exam</td>
<td>To be determined by Registrar’s Office</td>
<td>60%</td>
<td>Final Grade</td>
</tr>
</tbody>
</table>

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

The grades for the quizzes and assignment #1 will be returned prior to the voluntary withdrawal date (November 17, 2017).

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, that used by the Rady College of Medicine https://umanitoba.ca/faculties/health_sciences/medicine/admissions/8847.html. 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% total, or <45% in final exam).

There are no deferred in-class quizzes. 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 visit 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.

Students with disabilities 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.