This course introduces key concepts of veterinary embryology, genomics, and regenerative medicine. A comparative and application-based approach is taken when presenting the course material. The focus is to present issues relevant to veterinary medicine and to apply principles and theories to veterinary practice.

**THE PEOPLE WHO TEACH VETM*3390**

Course Coordinator and Instructor  
Dr. Thomas G. Koch, DVM, PhD  
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Office hours: TBD

Guest Lectures, Tentative Speaker List  
- Dr. W. Allan King, Biomedical Sciences, Ext 54927, waking@uoguelph.ca  
- Dr. Pavneesh Madan, Biomedical Sciences, Ext. 58738, pmadan@uoguelph.ca  
- Dr. Lee Niel, Population Medicine, Ext. 53030, neill@uoguelph.ca  
- Dr. Paul Woods, Clinical Studies, Ext. 54092, jwoods@uoguelph.ca  
- Dr. Janice Greenwood, IDEXX Canada, Markham, ON, 1-800-667-3411, Janice-greenwood@idexx.com  
- Dave Conley, Coorporate Cimmunications Director, AquaBounty Technologies Inc., USA; dconley@aquabounty.com

**COURSE STRUCTURE**

There are three main topics or sections to the course, namely embryology, genomics, and stem cells and regenerative medicine. Content related to these overall topics are mainly delivered during lectures by the coordinators and selected guest lecturers. Course notes and online lecture videos are provided for selected topics to aid student understanding. Student scientific literacy skills will be improved through instruction on how to critically evaluate and review peer-reviewed scientific journal articles. Students will be asked to compile information on one topic of interest in the form of two 300 word limit cue cards, where one cue card is to be written using proper scientific language while the other will be written using language used by veterinarians when conversing with clients (layman language). All cue cards will be made available to the class as supplemental material after they have been scored and will be published without their score or identifying student information.
COURSE DESCRIPTION & GOALS

This lecture-based course is designed to introduce key concepts of veterinary embryology, genomics, and regenerative medicine. A comparative and application-based approach is taken when presenting the course material. The focus is to present issues relevant to veterinary medicine and to apply the principles and theories presented in the course to veterinary practice.

The genomics portion of the course presents basic concepts of genetic principles, karyotyping, molecular diagnostic tests for detection of genetic anomalies, and applied genetic technologies. At the end of the course students should have a working understanding of genetic principles and technologies and at a basic level be able to provide genetic counseling to clients regarding animal health, reproduction, production traits, and breed standards. Animal history, diagnosis and/or pedigree information will have to be considered for effective genetic counseling and will be discussed for selected conditions.

The stem cell and regenerative medicine portion of the course introduces the basic concepts of what a stem cell is, how to source or engineer stem cells, and how stem cells are or can be applied in human and veterinary medicine. Regenerative medicine includes use of tissue-engineering principles and so-called biologics, such as for example platelet rich plasma. At the end of the course students should be able to advise clients on the potential benefits and risks of these emerging veterinary therapies.

The embryology portion of the course presents the basic concepts of embryology and the focus of the content will be on issues that are relevant to veterinary medicine including: early embryonic development, comparative placentation, and major organ system development. Embryology will be taught in a comparative manner to illustrate key differences in embryological development in common domestic animal species. Students will study the normal cellular and molecular events associated with development. Cases and examples will illustrate abnormal development and teratological defects that are more commonly seen in veterinary practice so that students gain an understanding of how and why development can go awry.

RECOMMENDED RESOURCES

Genetics/Genomics and Regenerative Medicine:
There is no specific textbook associated with the genomics, stem cells, and regenerative medicine sections. Course-notes will be provided for selected specific topics to provide an overview of the topic. Course notes will include references to mandatory or supplemental material for the students to independently read.
Introductory video modules on mode of inheritance, with self-testing options, are available on CourseLink. **Students are encouraged to review these videos prior to the lectures on mode of inheritance.**

Listed below are several good resources for these sections of the course:

**Genomics**
  Online Mendelian Inheritance in Animals (OMIA) is a database of genes, inherited disorders and traits in animal species (other than human and mouse) authored by Professor Frank Nicholas of the University of Sydney, Australia, with help from many people over the years. The database contains textual information and references, as well as links to relevant records from OMIM, PubMed, Gene, and soon to NCBI's Phenotype database. OMIA is manually curated.
- Veterinary Genetics and Reproductive Physiology: A Textbook for Veterinary Nurses and Technicians, Susan Long, Butterworth-Heinemann, 2006
- Genetics in Veterinary Medicine, P.K. Basrur, Vaspar Press, 2003
- Genetics in Medicine, Nussbaum R. et al, 6th Ed., 2001
- Introduction to Veterinary Genetics: F. W. Nicholas, Iowa State University Press, Iowa, 2003

**Stem Cells and regenerative Medicine**
▪ https://www.avma.org/News/JAVMANews/Pages/110215a.aspx

**Embryology:**
The embryology lectures are largely based on the following textbook. The book is considered supplemental material and copies are available in Dr. Koch’s office for short-term loan.

Another great embryology textbook, which is also considered supplemental material is:

**LEARNING OBJECTIVES**

**Genomics:**
At the end of the course the student should be able to:
1. Provide basic genetic counseling to clients with regard to animal diseases, production, reproduction, and breed standards.

In order to do this proficiently, the course sub-objectives are that the student will be able to:
2. Interpret karyotypes and pedigree charts.
3. Define and describe the genetic basis of Mendelian and non-Mendelian disorders.
4. Recognize and interpret the chromosomal basis of reproductive problems in domestic animals.
5. Describe the salient features and genetic components of specific conditions.
6. Become familiar with library and web resources for veterinary genetics.
7. Describe new and emerging genomic technologies and how these technologies may be utilized in breeding strategies, husbandry practices and clinical medicine.

**Stem cells and regenerative medicine:**
At the end of the course the student should be able to:
1. Empower clients to make informed decisions with regard to these emerging veterinary therapies.

In order to do this, the course sub-objectives are that the student will be able to:
2. Understand what stem cells are and how they are isolated or generated.
3. Understand stem cell characterization, maintenance, and differentiation methods.
4. Appreciate how (stem)cell-based therapies are being advocated/explored in veterinary medicine.
5. Appreciate regenerative medicine and tissue-engineering concepts.

Embryology:
By the end of the course the student should be able to:
1. Identify and define key structural and molecular elements involved in domestic animal development.
2. Understand the developmental sequence of body structures and the functional significance of these structures.
3. Explain and identify normal embryological anatomy and identify anomalies in development of various tissues through a comparison of normal and abnormal development.
4. Understand, using a comparative approach, the key differences in embryological development across common domestic animal species.

**COURSE ASSESSMENT**

<table>
<thead>
<tr>
<th>Assessment type</th>
<th>Weight</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm Exam</td>
<td>30%</td>
<td>• See Phase schedule for date and time</td>
</tr>
<tr>
<td>Cue Cards</td>
<td>10%</td>
<td>• Draft due date: Midnight, March 15th, 2017</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Final due date for grading: Midnight, March 31, 2017</td>
</tr>
<tr>
<td>Final Exam</td>
<td>60%</td>
<td>• See Phase schedule for date and time</td>
</tr>
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**Notes on Assessment:**

**Midterm**
The midterm is worth 30% of the final grade and will only cover material presented prior to the midterm exam. The test will consist of multiple-choice questions only.

**Final Exam**
The final exam will be cumulative and is worth 60% of the final course grade. The test will consist of multiple-choice questions only.

**Cue Cards**
The cue card assignment is worth 10% of the final course grade. Each student is expected to provide two cue cards on the same topic of their interest relevant to the course material presented. The topic must be pre-approved by Dr. Koch. The same information is provided on both cards, with the only difference between the cards being the language used. One card will use scientific language as one would use between peers, while the other card will use layman language as a veterinarian would use in conversation with a client. The word limit for each card is 300, excluding the reference list. The font Times New Roman size 12 must be used.

An overall course grade of 50% is required to pass this course.
Please see full details within the undergraduate student calendar found at the following link:
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c10/c10dvm-info.shtml

TEACHING METHODS

Lectures
There are a total of 30 lectures in the course, each 50 minutes in duration. Lecture notes and readings (PowerPoint slides for the lecture) will be posted to CourseLink prior to each lecture as a PDF file, one slide per page, to facilitate note-taking. Before the final exam, some lecture time may be devoted to review the key concepts presented within the course.

Course Notes
Course notes will be provided for selected topics and made available in CourseLink. Students will be expected to review these notes prior to the lectures pertaining to the topics. The notes are required reading and the material in the notes are examinable material.

Lecture Videos
There are four lecture videos on the mode of inheritance of genetic diseases that students can view online. These recorded lectures are self-directed optional learning units. Please see CourseLink for these lectures.

Online Material
Students will be introduced to selected articles, online databases, search engines, and videos. These resources will be for supplemental use or integral to a specific lecture discussion.

Cue Cards
The cue card assignment is an exercise to help develop student critical thinking and communication skills. Students will obtain, synthesize, and critically evaluate information from various sources (online databases, text books, scientific articles, etc) on a topic of their interest and create two forms of the same cue card; one written in scientific language while the other in layman’s terms. Appropriate communication is critical, as a practicing veterinarian often has to communicate scientific concepts, which are often difficult to
understand, to a client in a way that they will understand. All cue cards will be made available to the class as supplemental material after they have been scored and will be published without their score, but with the student name.

**COURSE POLICIES AND PROCEDURES**

**Attendance**
Students are expected to come to class on time and turn cell phones to vibrate/silent so as not to disrupt the lecture.

**CourseLink**
Will be used extensively throughout VETM*3390. Ensure to visit the site often!

- Course content – Please visit the *Content tab* for lecture notes, videos, etc
- Announcements – Last minute changes or special announcements will be posted within the *Newsfeed*
- Office hours – Dr. Koch do not have specific office hours, but is available to meet by appointment. Please email him to arrange an appointment when needed.
- Discussion boards – These *forums* provide opportunities for students to ask questions and discuss what is being learned in the course. Please direct all course content-related questions to the appropriate forum – odds are that if you have that question then at least one other student in the class does too!

**Electronic Etiquette**
Laptop computers are permitted in the classroom; however, research has shown that these devices can be disruptive to the classroom environment if students are not engaging in course-related activities (such as note-taking). Research has also shown you’re better off bringing pen and paper only to the lecture hall and leave your laptop in the bag ([http://m.theglobeandmail.com/life/health-and-fitness/health/brain-hacks-for-the-cluttered-mind/article20174600/?service=mobile](http://m.theglobeandmail.com/life/health-and-fitness/health/brain-hacks-for-the-cluttered-mind/article20174600/?service=mobile)).

If you choose not to study as an executive or noble laureate, then please be considerate of your fellow peers and use laptops for course-related activities only while in the classroom. If a student is using a laptop for unrelated activities such as social media, emailing, or texting, and it is evident that fellow students are being disrupted, Dr. Koch reserve the right to ask the student to leave the classroom. Dr. Koch strive to create a positive, fun, and engaging learning environment for all students.

Electronic audio or video recordings of the lectures are not permitted without the signed written consent of the course instructor. The use of electronic devices during the midterm or final exam is strictly prohibited.

**Email policy**
The University’s official method of correspondence with students is through a valid University of Guelph email account. It is the student’s responsibility to keep his/her U of
Guelph account active and to check it on a regular basis. All emails from students must include your full name, student number, and course code. All emails will be replied to within 24-48 hours. Please direct all course content-related questions to the appropriate Discussion Forum – odds are that if you have that question then at least one other student in the class does too.

**Remark policy**

*Midterm*

Requests for re-evaluation of the midterm must be made, in writing, to Dr. Koch within one week of return of the midterm. All requests must include appropriate reasoning for why the student deserves additional marks. Please be aware that an approval for a remark will result in the whole test being remarked. This may result in an increase, decrease, or no change in the original mark of the term test.

**Religious observance**

Information about the University of Guelph’s policy on academic accommodation of religious obligations can be found online.

http://www.uoguelph.ca/registrar/calendars/undergraduate/current

**Students with Disabilities**

The University of Guelph accommodates students with disabilities who have registered with Student Accessibility Services (SAS). Any students who require assistance from SAS must register with the centre (preferably within the first week of class) to arrange any accommodations needed. To schedule a registration appointment with a disability advisor, please call the centre at 519-824-4120 ext 56208 or email SAS at csd@uoguelph.ca

**Academic Consideration of missed assignment**

If you find yourself unable to meet course requirements by the deadline due to medical, psychological, or compassionate circumstances please review the regulations on academic consideration in the academic calendar.

Requests for academic consideration must be based on medical, psychological, or compassionate grounds. Requests, together with supporting documentation, should be submitted to the Associate Dean, Students (ADS).

Requests for academic consideration should, whenever possible, be made before the anticipated exam or assignment deadline occurs, not after. In acute situations or emergencies, the ADS’s office should be notified as soon as possible after the fact. Where ongoing problems will potentially interfere with a student’s coursework, then the student should inform the ADS’s office of this situation as early in the semester as possible so that any necessary arrangements can be made.

If the request for academic consideration is approved, the request shall be forwarded to the course coordinator by the ADS and the course coordinator will decide the form that the academic consideration will take.
Academic Misconduct
The University of Guelph is committed to upholding the highest standards of academic integrity and enjoins all members of the University community – faculty, students, and staff – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. The University of Guelph takes a serious view of academic misconduct and it is your responsibility as a student to be aware of, and to abide by, the University’s policy. Included in the definition of academic misconduct are such activities as cheating, plagiarism, misrepresentation, and submitting the same material in two different courses without written permission. To better understand your responsibilities, students are expected to read the section on Academic Misconduct in the Undergraduate calendar and academic integrity policies online (links below). You are also advised to discuss any questions that you may have with Dr. Koch or an academic counselor.

http://www.uoguelph.ca/registrar/calendars/undergraduate/current
http://www.academicintegrity.uoguelph.ca

Students must also be aware that faculty has the right to use software to aid in the detection of plagiarism or copying and to examine students orally on submitted work. For students found guilty of academic misconduct, serious penalties including possible suspension or expulsion from the University of Guelph may be imposed.