IMM250H1F "IMMUNITY AND INFECTION" – FALL 2018

Students will be introduced to the basic concepts of immunity to infectious disease. We will trace the history of current ideas in immunology by examining how bacteria and viruses cause disease and the initial discoveries that led to such developments as vaccination. Current topical and newsworthy infectious diseases (HIV, Ebola, avian flu, Sepsis) will be used as examples of how the immune system copes with microbial infections and how breakdown of the immune response can lead to diseases such as autoimmunity.

IMM250 is a required course for all immunology programs, however it is designed to fulfill breadth requirements and is an appropriate choice for students in other science or humanities programs. Development of writing skills through the composition of a science article for the general public is one objective of this course.

Recommended Preparation: BIO120H, BIO130H

COURSE DATES AND POLICIES

Class time: Tuesdays, 10am-12noon, Location: MSB 2158, MacLeod auditorium, Medical Science Building.

Course coordinator:
Dr. Liliana Clemenza   liliana.clemenza@utoronto.ca
All postings (lecture material and announcements) will be done on Quercus. Please check Quercus regularly.

Lecturers:
Dr. L. Clemenza
Office hours: Mondays 12:30-2:30pm, room MSB 7267. Please email in advance for appointment. Alternative office hours arrangements can be made upon request.

Dr. Wendy Tamminen   w.tamminen@utoronto.ca
Office hours: TBA

Guest Lecturer:
Dr. Tania Watts

In-class response system and interactive textbook

We will be using the Top Hat (www.tophat.com) classroom response system in class and in tutorials. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message. Additionally, we will be using a custom-built interactive Immunology textbook within Top Hat for this class. We will also be using Top Hat Test which allows us to go paperless and

run tests through any personal or mobile device (i.e. your phone or laptop) in an online, secure testing environment.

You can visit the Top Hat Overview (https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide) within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system.

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the app support button, or by calling 1-888-663-5491.

Note: A subscription to Top Hat, with related fees for the testing function and in-class response system, and purchase of the interactive textbook, are required for this course.

A discount for this 'bundle' has been arranged so that **the total cost of the course will be $54 after the discount is applied upon checkout - make sure you go all the way to the checkout page**. ($44 will cover the textbook, test function and in-class response system; the Top Hat subscription fee will be discounted to $10 at checkout.)

To subscribe and purchase the course bundle, go to:
https://app.tophat.com/e/791515
Note: our Course Join Code is 791515

Note: The Top Hat subscription as described above is required for this course and a small percentage (5%) of the course grades will be allocated for participation as specified below (see Evaluation).

Evaluation Description and Event Dates:

1. Midterm Test: **Weight 30%** (multiple-choice questions); covers the first five lectures.
When: **Tuesday October 16 2018, 10am-12noon**
Location: Exam Centre, rooms: TBA, 255 McCaul Street.
Last day to drop courses with 'F' section codes: November 5, 2018

2. Assignment - Science & Society Paper: **Weight 20%.**
Quercus submission deadline: **Sunday November 11, 2018 at 11.59pm**.
Submission is online, no hard copy submission required.

The penalty for late submission is 5% deduction from your paper's raw score per day of delay (e.g. if the raw score for your paper is 80 and you submitted two days past the deadline your raw score will be changed to 72). **Late papers must be**

submitted by Sunday November 25, 2018 at 11:59pm. No papers will be accepted after Sunday November 25.

Students with valid reasons for deadline extension must contact their registrar with the appropriate documentation. **Deadline extensions will be granted only following a request submitted by the student's registrar**.

3. Final Exam: **Weight 45%.**
Date and location will be announced. **The format of the final exam is multiple-choice and cumulative but biased towards the second part of the course.**

4. Top Hat participation: Weight 5%.
The questions embedded in the textbook will be assigned 0.5 point for participation and 0.5 point for correctness. The questions presented in class will be assigned 0.5 point for participation (they are not marked for correctness).

Deferred Exam
Students who miss the final exam for a valid reason may petition to the Faculty of Arts and Science to write the deferred exam. **The format of the deferred exam is written short-answer questions and is cumulative.**

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Tutorials:

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Pre-midterm: TBA
Term paper tutorial: TBA

NB: Tutorials are not mandatory but recommended. The tutorial slides will be posted on Quercus the day after each tutorial takes place.

Missed Term Test Policy
 If a term test is missed due to illness, then:
1. The student must obtain the University of Toronto 'Verification of Student Illness or Injury' form, have it filled out by their Physician, Surgeon, Nurse Practitioner, Registered Psychologist, or Dentist, and submit it to the Immunology Office (Room 7205, Medical Sciences Building), within one week of the missed exam. Forms submitted by email will not be accepted.
2. **If** the note confirms that the student was incapacitated on the day of the test, **then** the weighting of the students other graded work (including the final exam) will be increased by the amount of the missed test.
If the note does not confirm that the student was incapacitated on the date of the test, **then** a grade of "0" will be assigned for the test.
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THERE ARE NO MAKE UP MID-TERM TESTS

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LECTURE OVERVIEW

Date	Lecture	Lecturer
September 11	**Course Business**; **Overview of the immune system**: cells and receptors of innate and adaptive immunity are introduced with an historical perspective	L. Clemenza Readings: Chapter 1
September 18	**Features of the Adaptive Immune Response** **Basic lymphocyte biology**: how B cell and T cells recognize antigen and respond. Introduction to antibody classes **Hallmarks of the adaptive system:** specificity, diversity, tolerance, clonal selection and memory **Introduction to vaccines** What makes a good vaccine? Types of vaccines, herd immunity **Case study: Jenner's legacy - The eradication of smallpox**	W. Tamminen Readings: Chapter 4
September 25	**Innate Immunity: the first line of defense to infection** Types of pathogens; mechanisms of pathogenicity Case study - **Helicobacter pylori, Barry Marshall and his self-induced infection** **Sensing infection**: Pattern recognition receptors - Focus on Toll-like receptors	L. Clemenza Readings: Chapter 2
October 2	**The innate inflammatory response** **Cellular mediators of innate immunity:** Phagocytes and other cells of the innate immune system **Soluble mediators of innate immunity:** role of inflammatory cytokines and complement in immune defense Case study - **Disorders of complement regulation: hereditary angioedema**	L. Clemenza Readings: Chapter 3
October 9	**Generation of the adaptive immune response** **Activation of naïve lymphocytes:** Multiple signals initiate an adaptive response	W. Tamminen Readings: Chapter 5

	Secondary lymphoid tissues: Architecture and function; lymphocyte recirculation **The adaptive response in space and time:** How a typical adaptive immune unfolds Case study: **When the adaptive response is broken - David Vetter and 'SCID'**	
October 16	No class - Midterm Test	
October 23	**Fine-tuning the Adaptive Response** T cell subsets, effector cytokines; cell-mediated and antibody-mediated responses Case study: **Leishmania infection** **HLA – Your 'immunological fingerprint'** Physiological role of HLA molecules in T cell activation; role of HLA polymorphism in survival HLA in health and disease; role in personalized medicine; limitations and social implications Case study: **The plague of 1666 in Eyam, England**	W. Tamminen Readings: Chapter 6
October 30	**The Antibody Response** **Fine-tuning of antibodies:** Antibody effector functions: what happens when antibodies bind antigens **Monoclonal Antibodies in Medicine:** **What is a Monoclonal Antibody (mAb)?** Discovery, definition and implications **Therapeutic monoclonal antibodies:** Theory of the 'magic bullet'; unconjugated and conjugated antibodies, Rituximab as an example Case study**: The Story of Grace**	W. Tamminen Readings: Chapter 7
November 6	**Fall break - no class**	

November 13	**Immunology of the gastrointestinal tract - Anatomical and chemical barriers to intruders** Immune function of epithelial cells Breaking through the barriers: **Salmonella infection;** **Tolerance to food proteins.** Case study - **Food allergies** **Gut microbiota-immune system crosstalk** Keeping microbial growth in check through stratification in the gut lumen: mucus and mucins, defensins, IgA; Case study - **Losing tolerance to gut microbiota: Crohn's disease**	L. Clemenza Readings: Chapter 8
November 20	**Guest lecture - Influenza infection:** description of viral types, pathogenesis, pandemics in history, H5N1 flu, flu vaccines	T. Watts No readings, just lecture notes
November 27	**Immunopathology** **Septic shock:** an innate immune response gone out of control **Allergic reactions:** general mechanisms of allergic reactions; focus of food allergy **The autoimmunity epidemic** Mechanisms of tolerance to autoantigens: central and peripheral tolerance Impact of genes and environmental factors on susceptibility to autoimmune diseases The hygiene hypothesis	L. Clemenza Readings: Chapter 9
December 4	Review class	W. Tamminen L. Clemenza

Science & Society Assignment - Paper Topic:

 'CAR T cells – Groundbreaking cancer therapy at groundbreaking costs: hopes and challenges'.

The purpose of this assignment is for you to learn how to summarize the information gathered from several academic (e.g. review articles or primary articles from scientific journals) and non-academic sources (e.g. science news articles from reputable magazines [The Scientist, Scientific American, etc.], or newspapers [New York Times, The Guardian, etc.], reports from government and institution science

websites [NIH, Health Canada, WHO, etc.], science blogs, podcasts, etc.). From your collected material you will build a "story" for a general reader with or without a background in science. In other words, we want you to submit a piece of science writing using a journalistic approach. Some academic and non-academic references will be provided but you are encouraged to find your own sources of information and inspiration depending on the angle you decide to give to your article.

We will evaluate the following aspects of your paper:

Title (5 marks) - should be original and captivating. Do not use 'Science & Society Assignment (or Paper)', or our title 'CAR T cells' - groundbreaking cancer therapy at groundbreaking costs: hopes and challenges'.

Tone and style (35 marks) - decide on the type of narrative you want to deliver (e.g. general information essay mainly aimed at reporting facts, testimonial report or case study, questions and answers, timeline approach, others) and maintain it from the beginning to the end. Your aim is to be informative, interesting, concise and creative. This type of writing requires language that is not too scientific/formal, but it should not be too casual/colloquial either. For example, the use of analogies as a stylistic tool to embellish your prose and make your science story more accessible is allowed but its overuse is discouraged. Examples of good journalistic science articles on this topic will be posted on Quercus. Two student papers from last year's course will also be posted as examples. Links to science writing tips can be found below.

Content (35 marks) - Here are some suggestions of points that may be discussed in your paper:

1. A short introduction to describe CAR T cells as a type of cancer immunotherapy; the personalized therapeutic approach of CAR T cells; what types of cancer are good candidates for this therapy.
2. Description of CAR T cells: how are CAR T cells made, how they differ from normal T cells and how their molecular composition has changed from the building of the first chimeric antigen receptor. Why are CAR T cells considered 'revolutionary' in cancer therapy? A short exposition of the timeline of CAR T cell research is encouraged, including the successes and tragedies of several clinical trials that were undertaken, and ultimately led to the approval by FDA of two drugs in 2017.
3. Challenges
   a. Side effects: cytokine release syndrome and neurotoxicity are the most dangerous. Other problematic issues are the long-time permanence of CAR T cells in patients and their off-target effects, such as the killing of healthy B cells in patients with leukemia.
   b. High cost of production and logistics. Who should pay for CAR T cells? What

policies are in place, and how should they be modified, to make this treatment accessible to patients independently from their economic status and geography.

4. Hopes
   a. Building better CAR T cells. Researchers in the field are trying to control the activity of CAR T cells, for example adding to the engineered receptor safeguard molecules that unleash the cells only in the presence of cancer cells, or building a mechanism that disactivates CAR T cell when the patient is in remission.
   b. CAR T cells in Canada. Where do we stand?

Accuracy of information (15 marks) - You can take sides on arguments surrounding the topic or be neutral, either way we expect that you have checked your facts by consulting a few sources of information (minimum 4 references). We will evaluate whether you transferred this information into your story accurately. You are allowed a "moderate" use of short quotes in your articles (maximum 3 short sentences) but mostly you will summarize the information you gathered from your sources by writing a story in your own words. We require a complete reference list of consulted sources, including all web-derived sources, at the end of your article, and in-text citation. You are welcome to use your favorite citation style.

Format, Grammar and spelling (10 marks) - The paper needs to be 5-6 pages long (max 1800 words) and double-spaced. Font: 12 pt Times. One-inch margins.

To use the words of a well-known science writer (Roger Highfield, former editor of New Scientist and former science editor of the Daily Telegraph) ensure that your article "is interesting, clear and simple enough to grip a general reader yet accurate enough to satisfy a Nobel prizewinner".

Tips about writing for the general public can be found at:
"A field guide for science writers":
http://books1.scholarsportal.info.myaccess.library.utoronto.ca/viewdoc.html?id=2534&page=20
https://www.theguardian.com/science/science-writing-prize
http://awelu.srv.lu.se/genres-and-text-types/writing-in-academic-genres/popular-science-writing/

Important note about a prize for the best Science & Society Paper submitted to Imm250F 2018 or IMM250S 2019
Each TA will select the best paper in their group of students and submit it to the course coordinators for a second round of evaluation. The course coordinators will choose the best of all nominated papers and the winning paper will be published in the Fall 2018 issue of IMMpress Magazine, published by graduate students in the Department of Immunology at the University of Toronto. To follow through with

publication of the paper, the winning student will be required to re-format his/her paper to conform to the magazine's requirements.

Last year's winner and second placed papers will be posted on Quercus. These papers are on a different topic but can be viewed as an example of good style and content.

AVOIDING PLAGIARISM

Your term paper will be subject to "Turnitin" or other originality check softwares. You will be given the chance to check your originality score prior to the final submission of your paper. The instructors will perform the originality check whereas TAs will grade your paper.

It is NOT acceptable to copy & paste information from source material into your term paper.

This is plagiarism. Your paper must be IN YOUR OWN WORDS.

Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site.

Your term paper is worth 20% of your total grades. The University rule is that the Office of Student Academic Integrity deals directly with academic offenses related to assignments worth more than 10%.

If your paper is tagged by turnitin with a high similarity score (a high similarity score is anything above 25%), we will contact you. You will be given the chance to look at the similarity report generated by Turnitin and talk to us. After this step, we will send the report to the Academic Integrity Office that will start an investigation on the incident.

Remarking term papers

Students who would like more information about where they lost marks should file a request for a term paper re-evaluation utilizing a form that will be made available on blackboard. In this form the student will clearly indicate the reasons for the request and relate these reasons to the TA's comments. Vague requests such as: "I put a lot of effort in this term paper and I think I deserve a higher mark" will not be considered. If a term paper is re-evaluated, a **definitive** mark will be assigned to the term paper. The new mark may be higher than the original mark, or the same or even lower.

Notes from the Office of Student Academic Integrity of UofT

Academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the U of T degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves.

Familiarize yourself with the University of Toronto's *Code of Behaviour on Academic Matters* (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm). It is the rulebook for academic behaviour at the U of T, and you are expected to know the rules. Potential offences include, but are not limited to:

In papers and assignments:

- Using someone else's ideas or words without appropriate acknowledgement.
- Copying material word-for-word from a source (including lecture and study group notes) and not placing the words within quotation marks.
- Submitting your own work in more than one course without the permission of the instructor.
- Making up sources or facts.
- Including references to sources that you did not use.
- Obtaining or providing unauthorized assistance on any assignment including
  - working in groups on assignments that are supposed to be individual work,
  - having someone rewrite or add material to your work while "editing".
- Lending your work to a classmate who submits it as his/her own without your permission.

On tests and exams:

- Using or possessing any unauthorized aid, including a cell phone.
- Looking at someone else's answers
- Letting someone else look at your answers.
- Misrepresenting your identity.
- Submitting an altered test for re-grading.

Misrepresentation:

- Falsifying or altering any documentation required by the University, including doctor's notes.
- Falsifying institutional documents or grades.

The University of Toronto treats cases of academic misconduct very seriously. All suspected cases of academic dishonesty will be investigated following the

procedures outlined in the *Code*. The consequences for academic misconduct can be severe, including a failure in the course and a notation on your transcript. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact your instructor. If you have questions about appropriate research and citation methods, seek out additional information from your instructor, or from other available campus resources like the [U of T Writing Website](). If you are experiencing personal challenges that are having an impact on your academic work, please speak to your instructor or seek the advice of your college registrar.