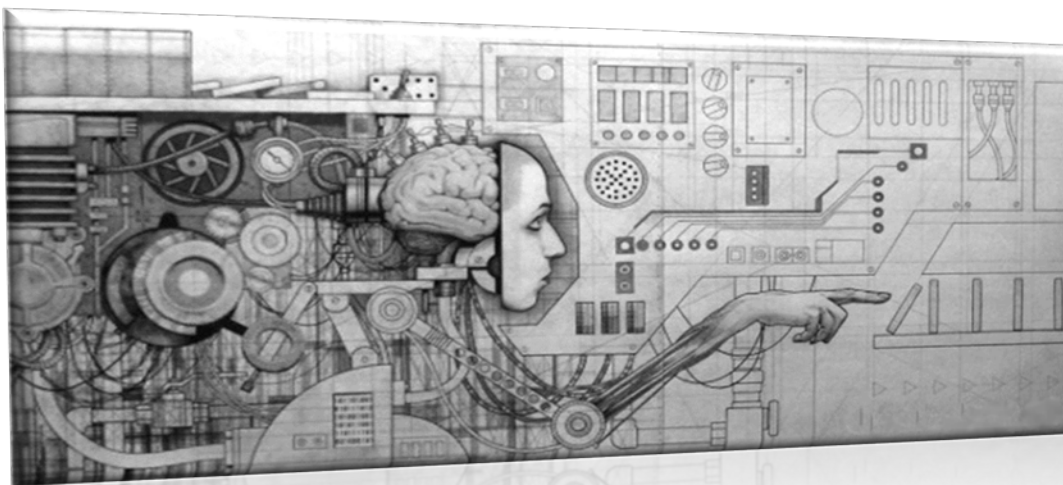


# SCIENCE IN THE MODERN WORLD



## The College of the Humanities (Humanities Program); HUMS 4103 Syllabus – Winter 2017

“An appreciation of what is happening in science today, and of how great a distance lies ahead for exploring, ought to be one of the rewards of a liberal arts education. It ought to be a good in itself, not something to be acquired on the way to a professional career but part of the cast of thought needed for getting into the kind of century that is now just down the road. Part of the intellectual equipment of an educated person, however his or her time is to be spent, ought to be a feel for the queerness of nature, the inexplicable things.”

- Lewis Thomas

### Calendar Description

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**HUMS 4103 [0.5 credit]**

#### **Science in the Modern World**

An introduction to the major scientific ideas of our time (such as Big Bang theory, molecular genetics, evolution, atomic structure), and the impact of technology on society (e.g. global warming, pollution, genetically modified foods, viral infections). Precludes additional credit for HUMS 4100 (no longer offered). Prerequisite(s): restricted to students in the Bachelor of Humanities program. Lectures three hours a week.

## Purpose of the Course

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During the last few centuries, scientific knowledge and technology have drastically altered our world. Yet basic questions remain. How is scientific knowledge is produced? What makes science different from other ways of learning about things? What does science say about reality? Is there is a sharp divide between science and non-science. We will reflect on the nature of science and how it affects our lives, and consider the relationships between science and the humanities. Finally, we will examine the role that science plays in a democratic society, and how citizens should think about scientific research. In addition to exposing students to modern science and its relevance to contemporary life, the course also aims to develop students' ability to think and write clearly about complex scientific ideas and arguments.

## Contact Information

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**Professor:** James J. Cheetham, Ph.D.  
Department of Biology  
**Office:** CTTC 4615 (Carleton Technology Training Centre)  
**Office hours:** Mondays (2:00 pm - 4:00 pm), or by appointment.  
**Phone:** 520-2600 Ext. 3867 (E-mail is best).  
**E-mail:** [james\\_cheetham@carleton.ca](mailto:james_cheetham@carleton.ca)



## Course Materials

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**Lectures:** Monday evenings – 6:00 pm to 9:00 pm  
**Place:** College of Humanities Lecture Room  
**CuLearn:** This course has lots of cuLearn content.  
**Textbook:** There is not an official textbook for this course.  
There are, however, readings on the cuLearn pages.  
**Schedule:** On the cuLearn page



## Prerequisites

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This course is restricted to students in the Bachelor of Humanities program. Curiosity about the world, and an open mind are also valuable.

## Office Hours

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Office hours are Mondays from 2:00 pm to 4:00 pm at my office (CTTC 4615). Feel free to send me questions by email or better yet, post them in the cuLearn Forum. You can also schedule an appointment by sending me an email.

## Assessment

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Students are responsible for, and may be tested on, all the material discussed during all lectures (including guest lectures), and discussion sessions. Also all required reading and video materials, whether covered in lecture or not are fair game. There will be a total of 100 marks from the tests, assignments, and participation.

<b>Assignments</b>	<b>30% (2 x 15% each)</b>
<b>Tests</b>	<b>30% (3 x 10% each)</b>
<b>Grant Proposal</b>	<b>30%</b>
<b>Participation</b>	<b>10%</b>
<b>Total</b>	<b>100%</b>



## Assignments

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All Assignments in this course should be formatted and documented following Chicago style. If you have any questions about how to document a source after checking the Chicago handbook please ask me, preferably in the Forums so other students can benefit as well, but of course by email at any time All papers should be 12 pt. font double-spaced from top to bottom without interruption or extra line spaces, with 1" margins all around. Properly setting up your paper counts toward part of your mark on the assignment (**see the Assignment Rubrics**).

## cuLearn Tests

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The tests during the term will be conducted **online** using cuLearn, and will consist of multiple choice questions, with a few short answer, fill-in-the-blanks, and matching questions.

Students are expected to take the tests during the scheduled times. Each test will be available during a 24 hour window (from 12:01 am on the test day, until 11:59 pm on the test day). Once you start the test, you will have **ONE HOUR** to finish it. You do not get multiple attempts. There are **THREE** cuLearn tests during the term. **There are no make up tests.**

There is a sample quiz on the Quiz Page in cuLearn. I suggest you do this sample quiz before the first REAL quiz to make sure you understand how the online quizzes work.

## Attendance and Participation

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Your attendance at the lectures is mandatory and your participation in class, in group activities and in the forums will be evaluated by the instructor. Despite what Woody Allen says, participation does **NOT** mean just showing up. **See the Participation Rubric.**

### Some suggested ways to participate:

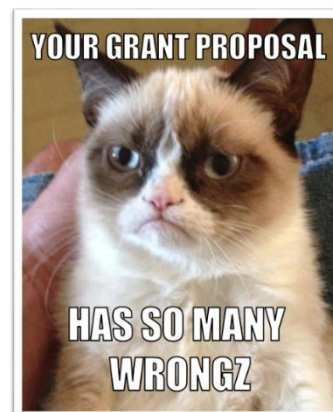
- Ask questions in class and during guest lectures.
- Contribute interesting articles, comments analysis and opinions to the cuLearn Forums.
- Be active and contribute ideas during discussions.
- Be prepared for class.

## Grant Proposal

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One way to understand science is to do what scientists do, and one thing that scientists do is write grants. Therefore, you are required to write a Grant Proposal for research on a scientific problem. You can transcend the arts and sciences in your proposal, but make sure to get approval of your topic from me in the first month of class.

The objectives for the proposal are first, to learn how science is used to formulate and solve problems, second to hone your academic writing skills, which include construction of a logical and persuasive argument. The proposal will evaluate your knowledge base, ability to ask good questions, formulate hypotheses, propose experiments, and also your ability to integrate and synthesize information and develop a logical argument.





## Reading and Video Materials

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Slides used in class and links to the required and optional reading and video materials for the course are available on the cuLearn pages. I suggest you scan the available material before the lectures, and then read it again, after the lectures. You will spend a lot of time reading. There are also videos to help you learn about science and technology. I suggest you watch them, they will help you.

See the [Lecture Schedule](#) for the detailed schedule of lectures, topics, readings, test dates, and assignment due dates.

**Keep up with the readings and the videos.** I cannot stress this enough.

## Electronic Communication

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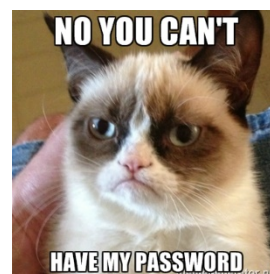
### cuLearn

Use of cuLearn is required for HUMS 4103. You may access it at any of the computer labs on campus or on your own computer with an internet connection. Access the HUMS 4103 CuLearn course page to see: lecture slides, readings, tutorials, videos, class announcements, assignments, tests, the glossary, or view your grades. Check out the resources for how to succeed in this class. The Course Webpage will be updated as needed during the term.

You may need to download plug-ins so you can view the tutorials I have included in this course. For help and support, go to [carleton.ca/cuLearnsupport/students](http://carleton.ca/cuLearnsupport/students). Any unresolved questions can be directed to Computing and Communication Services (CCS) by phone at 613-520-3700 or via email at [ccs\\_service\\_desk@carleton.ca](mailto:ccs_service_desk@carleton.ca).

### E-mail

I receive many emails every day, so do not despair if you don't get a reply right away. I can usually reply within 24 hours. You all have a Carleton E-mail addresses by virtue of enrolling at Carleton. Any questions about grades, etc., must come from your Carleton account, this is university policy, so some hacker cannot send an email from a GMail account and find out your grades.



**Don't give your Carleton E-mail password to anyone.**

Please send me an email at: [james\\_cheetham@carleton.ca](mailto:james_cheetham@carleton.ca) and I will respond, so we know that our electronic communication is working, and your emails are not going into my junk folder. This is also a way for me to check if you have read, at least this far, in the syllabus.

## Academic Accommodation

<http://www2.carleton.ca/equity/accommodation/academic>

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### Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Pregnancy obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the [Student Guide](#)

**Religious obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the [Student Guide](#)

**Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the [PMC website](#) for the deadline to request accommodations for the formally-scheduled exam (if applicable).

## Academic Regulations

<http://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity>

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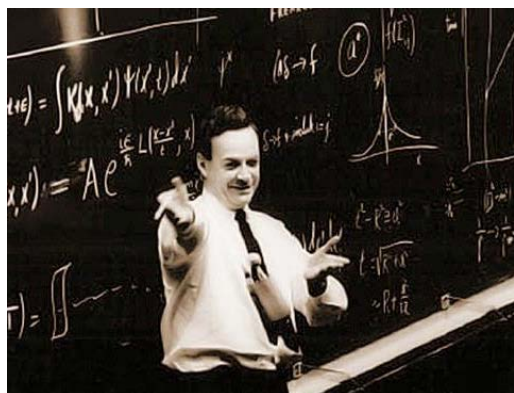
Carleton University is committed to ensuring fairness and consistency in the completion of assignments, and examinations. As part of this commitment, students are required to follow proper assignment and examination procedures. A student who commits a violation of this policy on an examination or assignment, or obtains or produces an answer or unfair advantage by deceit, fraud, or trickery, or by an act contrary to the rules of the assignment or examination are subject to the sanction under this Policy. You are expected to follow the Academic Regulations of the University. In particular, **pay attention to the section on Student Conduct**. If you are not sure about the definition of cheating, come and see me, and I will explain it to you in more detail.

## About HUMS 4103

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We live in a world dominated by science and technology. Science has become an integral part of human cultures and arguably, the single most widely-accepted authority for public decision-making. Similarly, technology: tools and the practical application of scientific knowledge, has always been an essential feature of human history. We cannot escape science and technology and their importance to our everyday lives. As a result, it is essential for us to better understand science and technology. In this course, we will examine how science and technology have shaped the modern world, and how society and culture have shaped the production and consumption of science and technology throughout history. This course will challenge you to think about the world in unorthodox ways, and to find links between different sciences, and between science and other disciplines.

Students studying science often feel like they are learning a new language. The best way to learn complex disciplines is to become an active participant in them. How can that be achieved in this course? First of all, try teaching other people about what you learn and explain concepts to them. The most satisfying proof of mastering a difficult topic is the ability to explain it to another person. It is expected that you will work with other students outside the classroom in preparation for lectures and tests. Another way to become actively engaged in the study of science is to take full advantage of Discussion Forums on CuLearn.



**So I find that teaching and the students keep life going, and I would never accept any position in which somebody has invented a happy situation for me where I don't have to teach. Never.**

**— Richard P. Feynman**

## Learning Outcomes

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To enable your learning, I clearly state Learning Outcomes. There are Learning Outcomes for the entire course, and also Learning Outcomes associated with each lecture.

The Learning Outcomes are designed to increase your understanding of science and technology as an ever-developing body of knowledge, the provisional nature of scientific explanations, the complex relationship between evidence and ideas in science and the impacts of science and technology on the modern world. Course material (lectures, readings, videos, etc.) and assessments (tests, assignments) are aligned with these learning outcomes.



### **Learning Outcomes for the course are the following:**

#### **Students who successfully complete this course will be able to:**

- Explain science as a way of thinking.
- Distinguish between science, pseudoscience and non-science.
- Describe important historical events and people in the development of modern science.
- Evaluate pros and cons of new scientific discoveries.
- Effectively communicate about science and technology in writing.
- Explain the provisional nature of scientific knowledge.
- Explain the importance of the principle of tolerance in science.
- Describe some important theories and methods in modern science.
- Identify and intelligently discuss controversies and ethical issues in science and technology.
- Contribute to discussions of current scientific news items to help develop an awareness of science in the modern world.
- Develop individual interests, through assignments, that engage a scientific or technological controversy, policy problem, genetic disease, or application of science.
- Explain why your genotype does not equal your phenotype.
- Recognize and articulate the impacts of science and technology on your own life, the lives of others, the environment, society and our planet.

**There are also learning outcomes associated with each lecture.**



## What I Expect from You

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I expect you to extend your study of science and technology outside the classroom. For example, the quizzes and assignments will not only test your knowledge of the information presented in lectures, but also your synthesis of the information into a logical whole – the big picture. I expect you to consider science and technology in your other courses and to discover how ideas and concepts presented during the semester affect your health, the environment, and the world as a whole. Your success as a student depends upon your ability to think creatively and critically. Therefore, I intend to foster and expand the creative intellect already resident in your thoughts, and ***I expect you to be open to new ways of thinking and to challenge old ways of thinking.***

## What You Can Expect from Me

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Learning is what a student does (I cannot force you to learn). My role is to **facilitate** learning (by stating explicit learning outcomes, lecturing, answering questions, etc.) and to **assess** learning (assignments, quizzes, etc.). Remember that you are doing this work for yourself (to prepare for your future adventures), not for the instructor.

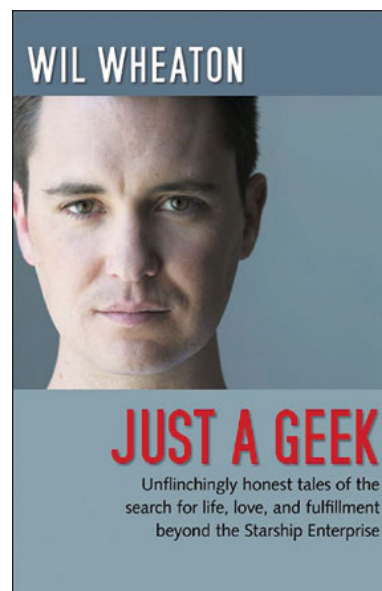
You can expect me to be prepared for class with both knowledge and enthusiasm. You can expect patient and thoughtful teaching and help both within and outside our scheduled time together. You can expect that I will utilize all reasonable resources to help you succeed in this class. Don't be afraid to seek help when needed. I am here to help you learn the material in this course and to provide an impartial evaluation of your performance. It's tough sometimes, but it's OK to ask questions in lecture, or in the Discussion Forum. Come to office hours, or make an appointment, if you have more detailed questions. Use the CuLearn Forums. Send me an email.



## General Course Policies

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1. Your experience in this course (and in life) will be more enjoyable if you treat your classmates and your instructor with courtesy and respect (**Google “Wheaton’s Law”**).
2. When you come to class, be on time, and be prepared. If you are unavoidably late, enter the room quietly and choose a seat as quickly as possible. Do not invite your friends in to chat in this class. Disruptions in class make me very unhappy. And unhappy professors write really, really hard test questions.
3. Once in class, stay for the duration. If you must leave early, give me advance warning. You will not be allowed to meander in and out of the classroom. This is disruptive and unfair to your fellow students, and also makes me unhappy (see comment #2 above). Take care of your personal needs before class.
4. Turn off the sound on communications devices. This includes cell phones, personal entertainment (TV, music, etc.) devices or anything else that will disturb your classmates. Students with special circumstances need to speak with me right away. Do not talk on your cell phone while I am lecturing, or a guest is lecturing. (see comment #2 above about unhappy professors and extremely difficult exam questions).
5. No chit-chat or unnecessary noise during lectures. This is a big class, and if everyone is making noise, no one can hear anything. Stay focused on the material under consideration during lecture. You are paying a lot of money to be in this class. If somebody is talking near you, he or she is disrupting your learning experience, and essentially stealing your tuition money. You are not paying tuition to listen to buddy talk about his very nutritious breakfast (save that for Twitter). I suggest you ask them to shut up.
6. Academic dishonesty is not tolerated. If you are unclear about what is dishonest, please see the Undergraduate Calendar for clarification. If you are still unsure about specific instructions, ask me. Science is a collaborative endeavor. Therefore, you are encouraged to work together as much as possible. However, tests are not collaborative and must be completed without the assistance of other people.

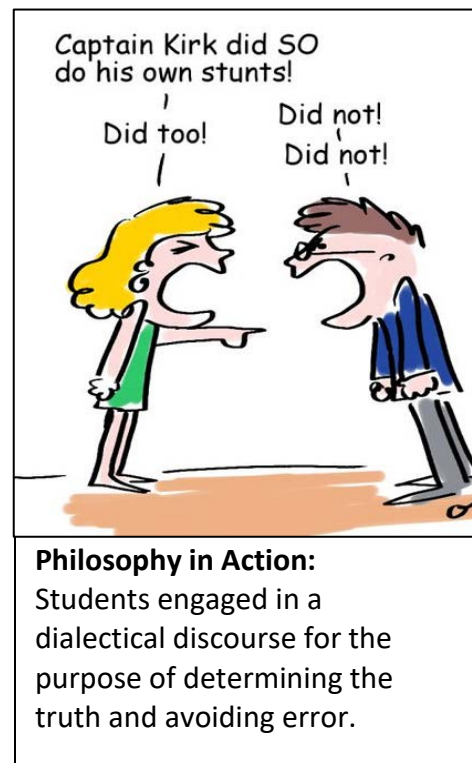


## Forum Discussion Guidelines

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**Source:** Howard Gabennesch, (1992) The Teaching Professor, 6(9).

1. Try to make comments that connect ideas from the course with phenomena outside the classroom, and between ideas in one part of the course and those in a different part.
2. Avoid war stories, rambling speeches heavily punctuated with the word "I," and raw opinions that we could just as easily get from the average patron at the nearest pub, who has never heard of this course and its assigned reading.
3. Realize that when our emotions are aroused our brain wants to take orders from them. It is essential; therefore, to be willing to disconnect one's brain from one's gut long enough to render due process to ideas, particularly those that are unpopular or personally distasteful. This is an unnatural act, and requires courage. You will probably find it easier to join lynch mobs from time to time.
4. Understand that the right to have an opinion does not include the right to have it taken seriously by others. Nor is having an opinion necessarily laudable in itself. An opinion is only as good as the evidence, theory, and logic on which it is based.
5. Be careful about basing your opinions uncritically on the testimony of experts. Experts are subject to error and bias. They often disagree with other experts. All of this applies to the authors of your texts and your professors.
6. Beware of the tendency to view questions in dichotomous terms, such as either-or, all-or-none. The world is a complex, messy place where absolute answers are hard to find, gray is more common than black and white and contradictory things are often in the same package. **(Watch the Jacob Bronowski video).**
7. Value tentativeness. It's OK to admit you're unsure. It's OK to change your mind. **(Watch the Jacob Bronowski video, again).**



## Winter Term 2017 – Important Dates and Deadlines

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<u>Date</u>	<u>Activity</u>
January 2	University reopens
January 5	Winter term classes begin.
January 18	Last day for registration for winter term courses. Last day to change courses or sections (including auditing) for winter term courses.
January 31	Last day for a fee adjustment when withdrawing from Winter term courses or the Winter portion of two-term courses (financial withdrawal). Withdrawals after this date will create no financial change to Winter term fees.
February 17	April examination schedule available online.
February 20	Statutory holiday, University closed.
February 20-24	Winter Break. Classes are suspended.
March 1	Last day for UHIP refund applications for International Students who will be graduating this academic year. Last day for receipt of applications from potential spring (June) graduates. Last day for receipt of applications for admission to an undergraduate program for the summer term.
March 10	Last day to request formal exam accommodations for examinations to the Paul Menton Centre for Students with Disabilities. Late requests will be considered on case-by-case basis.
March 24	Last day for tests or examinations in courses below the 4000-level before the final examination period (see Examination Regulations in the Academic Regulations of the University section of this Calendar).
April 7	Winter term ends. Last day of fall/winter and winter-term classes. Last day for academic withdrawal from fall/winter and winter term courses. Last day for handing in term work and the last day that can be specified by a course instructor as a due date for term work for fall/winter and winter-term courses.
April 10-25	Final examinations in winter term and fall/winter courses may be held. Examinations are normally held all 7 days of the week.
April 14	Statutory holiday, University closed.
April 25	All take home examinations are due on this day.





## REGULATIONS COMMON TO ALL HUMANITIES COURSES

### COPIES OF WRITTEN WORK SUBMITTED

Always retain for yourself a copy of all essays, term papers, written assignments or take-home tests submitted in your courses.

### PLAGIARISM

The University Senate defines plagiarism as “*presenting, whether intentional or not, the ideas, expression of ideas or work of others as one’s own.*” This can include:

- reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source;
- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another’s data or research findings;
- failing to acknowledge sources through the use of proper citations when using another’s works and/or failing to use quotation marks;
- handing in “*substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs.*”

Plagiarism is a serious offence which cannot be resolved directly with the course’s instructor. The Associate Deans of the Faculty conduct a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of “F” for the course

### GRADING SYSTEM

Letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100 (12)	B = 73-76 (8)	C - = 60-62 (4)
A = 85-89 (11)	B- = 70-72 (7)	D+ = 57-59 (3)
A- = 80-84 (10)	C+ = 67-69 (6)	D = 53-56 (2)
B+ = 77-79 (9)	C = 63-66 (5)	D - = 50-52 (1)

F	Failure. Assigned 0.0 grade points
ABS	Absent from final examination, equivalent to F
DEF	Official deferral (see “Petitions to Defer”)
FND	Failure with no deferred exam allowed -- assigned only when the student has failed the course on the basis of inadequate term work as specified in the course outline.

Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean.

### WITHDRAWAL WITHOUT ACADEMIC PENALTY

The last date to withdraw from **FALL TERM** courses is **DEC. 9, 2016**. The last day to withdraw from **FALL/WINTER (Full Term)** and **WINTER** term courses is **APRIL 7, 2017**.

### REQUESTS FOR ACADEMIC ACCOMMODATION

You may need special arrangements to meet your academic obligations during the term because of disability, pregnancy or religious obligations. Please review the course outline promptly and write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at: [carleton.ca/equity/accommodation/](http://carleton.ca/equity/accommodation/)

Students with disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities could include but not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC, 613-520-6608, every term to ensure that your Instructor receives your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you only require accommodations for your formally scheduled exam(s) in this course, please submit your request for accommodations to PMC by **Nov. 11, 2016** for the Fall term and **March 10, 2017** for the Winter term. For more details visit the Equity Services website: [carleton.ca/equity/accommodation/](http://carleton.ca/equity/accommodation/)

### PETITIONS TO DEFER

If you miss a final examination and/or fail to submit a **FINAL** assignment by the due date because of circumstances beyond your control, you may apply a deferral of examination/assignment. If you are applying for a deferral due to illness you will be required to see a physician in order to confirm illness and obtain a medical certificate dated no later than one working day after the examination or assignment deadline. This supporting documentation must specify the date of onset of the illness, the degree of incapacitation, and the expected date of recovery.

If you are applying for a deferral for reasons other than personal illness, please [contact](#) the Registrar’s Office directly for information on other forms of documentation that we accept.

Deferrals of a final assignment or take home, in courses without a final examination, must be supported by confirmation of the assignment due date, for example a copy of the course outline specifying the due date and any documented extensions from the course instructor.

Deferral applications for examination or assignments must be submitted within **3 working days** of the original final exam.

### ADDRESSES: (Area Code 613)

College of the Humanities 520-2809	300 Paterson
Greek and Roman Studies Office 520-2809	300 Paterson
Religion Office 520-2100	2A39 Paterson
Registrar's Office 520-3500	300 Tory
Student Academic & Career Development Services 520-7850	302 Tory
Paul Menton Centre 520-6608/TTY 520-3937	501 Uni-Centre
Writing Tutorial Service 520-6632	4 <sup>th</sup> Floor Library
Learning Support Service 520-2600 Ext 1125	4 <sup>th</sup> Floor Library