Health Sciences 2E03
Inquiry II: Biochemistry—2017-2018 (Fall Term)

PROFESSORS:

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COORDINATOR:

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OPTIONAL TEXTBOOK:

Jeremy M. Berg, John L. Tymoczko & Lubert Stryer's *Biochemistry, 5th ed.*
http://www.ncbi.nlm.nih.gov/books/NBK21154/

COURSE OBJECTIVES:

The primary objective of this course is to provide an introduction to Biochemistry and Molecular Biology by examining key biological problems relevant to human diseases.

Because inquiry courses emphasize both process and content, a secondary objective of this course is to build on your first year inquiry skill set. Throughout this course, you will refine your verbal and written communication skills, your ability to find and critically evaluate information, and your ability to work effectively as a member of a group.

This course will also offer preparation for future courses in the Department of Biochemistry and Biomedical Sciences in areas of gene expression, structure and function of macromolecules and membranes, clinical biochemistry, nutrition and metabolism, biochemical immunology and pharmacology, or a senior research thesis with a member of the department.

LEARNING OBJECTIVES:

1. To consolidate a basic understanding of nucleic acid and protein structure and function, and to understand the relevance of this information to health/disease.
2. Specifically, to understand the principles of protein structure and its implication for function.
3. To apply biochemical knowledge to the underlying mechanisms of system function.
4. To understand the relevant factors that cause disease.
5. To understand the purpose and methodology of experimental analyses behind the discovery and diagnosis of diseases.
6. To identify potential targets and applications for treatment.
7. To know the issues of importance to health and treatment of disease.
THE TASK:

Each drug used for therapeutic purposes causes a desired effect by targeting a specific protein/enzyme in our cells. For the drug assigned to your group, you and your group members will have to accomplish the following aims:

1. Identify the protein or enzyme that constitutes the main target for this drug.
2. Describe and understand the condition/disease that this drug is used to treat.
3. Explain the mechanism of action of this drug at the molecular level to produce the desired therapeutic effect.
4. In some individuals, drugs do not cause the expected effect and the drug seems to be inactive. Is this a potential issue with your assigned drug? How is this situation explained at the molecular level? In addition to the desired effect, some drugs also cause unwanted effects known as ‘side effects’. Have any side effects been described for your assigned drug? How are these ‘side effects’ explained at the molecular level?

THE PROCESS:

1. LearnLink: A LearnLink folder is set up for communicating important information from the professors and coordinator as the course unfolds. Be sure to check this general folder often for important announcements (HTH SCI 2E03 - Inquiry II). This folder will also contain sub-folders for each professor and for each group. Here each group can communicate with their members, schedule meetings, and share information, or direct specific questions to one of the professors. As the course progresses, additional folders and forms will appear in this folder for electronic submission of PowerPoint presentations and group evaluations.

2. Progress Meetings: Throughout the term, groups will meet with their professor for 40 minutes, as per each group’s schedule (see Schedule below). The purpose of these meetings is to report on their recent work, review progress and set directions. You should come prepared to show any evidence of your research and learning; e.g. you may bring a copy of key papers or review articles that have guided you. Meetings will be informal, and groups are encouraged to use PowerPoint or overhead slides to present their work. During the progress meeting, two (2) members of the group will be chosen at random to present on behalf of the group. The presentation should last no longer than 20 minutes, leaving 15 minutes for questions/discussion. Each member of the group will receive a mark based on the performance of the chosen individual, so it is in your best interest to work cohesively and to a common understanding. Please ensure your group arrives at least 5 minutes before your scheduled time, and you leave promptly after meeting with your professor, as we are running at tight schedule. Because the success of the group depends on the full participation of all members, attendance at all meetings is mandatory (see Missed Work and Late Submissions below).

3. Journal Article Review: Each group will be assigned a primary journal article to review. As a group, you will be expected to conduct an in-depth analysis of the article, for example, review the methodology, critically evaluate the findings and discuss the relevance of the study to both past and future research. The written report should be single-spaced, with no more than six lines per inch. Use Times New Roman regular 12-point font or any comparable font with 1-inch margins. The report should not exceed five (5) single-sided pages. Figures, tables and references are not included in the 5-page limit. Use the Vancouver style for all referencing in this course. Guidelines can be found at: https://www.imperial.ac.uk/media/imperial-college/administration-and-support-services/library/public/vancouver.pdf. Do not refer to websites. Guidelines for critical analysis of a primary research article are as follows: Each group is required to submit their written report to Turnitin.com as well as a digital copy to the ‘2E03 Journal Article Review’ folder on LearnLink. The Turnitin.com information is as follows.
Provide the title and full reference of the article on your analysis, and attach the article to your completed analysis before submitting it. This assignment is worth 20 marks, as broken down below. Specific instructions regarding formatting and page limits can be found in the course outline that you received previously. Your task is to critically analyse the quality and content of a primary journal article that was assigned to your group. The following points should guide you in your analysis. For your assignment address each point and comment in point form or paragraph form. Include any additional commentary that would further support your analysis of the paper.

**THE ESSENTIALS OF A SCIENTIFIC CRITIQUE:**
1. Give a brief background on the study
2. State the study's hypothesis or primary research question
3. Describe the basic approach used in the study
4. Describe the results of the study
5. Explain the significance of results of the study
6. Critique the study

1. **GIVE A BRIEF BACKGROUND ON THE STUDY (2 marks):**
   Explain the rationale for undertaking the study.
   What is the context for this study?
   What previous work led up to experiments done in this study?
   Focus on key studies leading to this set of experiments, and explain the importance of the problem in a wider context.

2. **STATE THE STUDY’S HYPOTHESIS OR PRIMARY RESEARCH QUESTION (1 mark):**
   State the study's hypothesis.
   What are the scientific questions being addressed in this study?

3. **DESCRIBE THE BASIC APPROACH USED IN THE STUDY (4 marks):**
   Briefly describe model system and/or special techniques being used. You can use diagrams or flow charts to support your description. Don’t simply restate the materials and methods sections.
   Why did the authors choose this approach to address the questions?
   What are the advantages/disadvantages of the system/technique chosen?

4. **DESCRIBE THE RESULTS OF THE STUDY (3 marks):**
   Briefly describe data shown in each figure/table/diagram.
   State conclusions made from each figure/table/diagram.
   Are the data presented in a manner that highlights general trends or significant results?
   Which data are the most significant to you, and why?
   Are there supplementary data? What additional insights do they provide?

5. **EXPLAIN THE SIGNIFICANCE OF RESULTS OF THE STUDY (5 marks):**
   Briefly describe what the importance of the results.
   Has this study changed the way of thinking in the field?
   Have the results refuted existing models or proposed mechanisms?
   Have the results provided more definitive evidence to support existing models/mechanisms?
   What new hypotheses/experiments are suggested by this work?

6. **CRITIQUE THE STUDY (5 marks):**
   What type of journal was the study published in, and what is the study’s impact factor?
Are there alternative interpretations for the data presented?
Can you think of additional controls that should have been done?
What other approaches could be undertaken to improve on this study?
Expand on any other points that you feel are important.

4. **Final Presentation**: At the conclusion of the course, each *group* will deliver a formal presentation of their findings to the other two groups in their cohort. **Two (2) students from each group will be chosen at random to deliver the presentation.** As a suggestion, the organization of the presentation can be broken down into sections to be shared by the two presenters, at the discretion of their group: e.g. 1) background, 2) major findings, and 3) discussion/conclusion. Following the presentation, all members of the group will proceed to the front of the room to answer questions from the audience. The presentation should last no longer than 20 minutes, leaving 15 minutes for questions. Be sure to appropriately reference your resources. Any information (including figures) or ideas that are not your own, must be referenced to the primary source (not a general textbook). All PowerPoint presentations must be sent to the '2E03 Final Presentation' folder on LearnLink by noon on the day of your presentation. Please note that the overuse or inappropriate use of animations and special effects can detract from the overall effectiveness of the presentation.

**CONTENT (15 marks):**
- Was the background material appropriate, not excessive, and did it help the audience's comprehension of the topic?
- Did the group demonstrate an understanding of basic biochemical principles and their protein?
- Did the group use adequate evidence from original research to support the material presented?

**ORGANIZATION AND FORMAT (6 marks):**
- Was the format of the presentation well organized and presented in a logical, easy-to-follow sequence?
- Was the presentation indicative of a clearly defined set of objectives?
- Was the use of visuals appropriate and legible?

**CLARITY AND DELIVERY (5 marks):**
- Clear, appropriate use of scientific language, terminology
- Were the speakers clear and audible?
- Did the speakers remain attentive and enthusiastic throughout the presentation to make it rewarding for the audience and sustain interest?
- Was the delivery practiced and smooth?

**POST-PRESENTATION (4 marks):**
- Ability to answer questions
- Demonstrated knowledge of biochemistry

5. **Group Evaluations**: Both at the midterm, and at the end of the term, each student will be required to assess their group’s work in an evaluation submitted electronically on LearnLink. You will be asked about each member’s participation and preparation, knowledge acquisition, group dynamics, contribution to the group, etc. Keep these important aspects in mind throughout the term as you work within your group, as you will be expected to provide comprehensive assessments. A confidential folder for submitting these applications will appear on LearnLink. **These mandatory group evaluations will be used as a tool to flag any group conflicts that were not obvious to the professors, and are part of the allocation of your marks for Progress Meetings.** It is expected that all groups meet with their Group Process Peer Tutor to discuss all aspects of group dynamics. If group conflict arises, Group Process Peer Tutors are there for the group as a
whole to discuss and facilitate resolution of any group issues. **It is the entire group's responsibility to work together towards a resolution.**

6. **Group Process (Peer Tutors):** Each group will be required to meet with an assigned peer tutor once every 2 weeks to continue to develop group process skills. The sessions will be one hour in length. The meeting schedule will be posted on LearnLink by mid-September. **If you have any questions and/or concerns regarding this component, please contact Margaret Secord on LearnLink or MDCL-3308 or x22655.**

**MARKING SCHEME:**

- Progress Meetings (individual mark) ➢ Participation, Discussion, Presentation: 50%
- Journal Article Review (group mark): 20%
- Final Presentation (group mark): 30%

Conversion from percentages to letter grades will follow the standard McMaster procedure (please see the Table below). All percentage grades within 0.5% of the next letter grade will be reviewed.

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<th>%</th>
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<tr>
<td>90-100</td>
<td>A+</td>
<td>77-79</td>
<td>B+</td>
<td>67-69</td>
<td>C+</td>
<td>57-59</td>
<td>D+</td>
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<td>85-89</td>
<td>A</td>
<td>73-76</td>
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<td>B-</td>
<td>60-62</td>
<td>C-</td>
<td>50-52</td>
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**GROUP AND TASK ASSIGNMENTS:**

There will be 30 randomly assigned groups, named after amino acids. The group and task assignments are below. The 30 groups will be divided amongst the 5 professors. Group assignments are appended below.

**Dr Bishop (C01)**
- Alanine (Aspirin)
- Glycine (Penicillin)
- Leucine (Ifenprodil)
- Methionine (Digitalis)
- Tryptophan (Epinephrine)
- Valine (Colistin)

**Dr Mullarkey (C02)**
- Arginine (Oseltamivir)
- Aspartate (Sofosbuvir)
- Glutamate (Ritonavir)
- Histidine (Adalimumab)
- Lysine (Sirolimus)
- Proline (Tacrolimus)

**Dr Seidlitz (C03)**
- Asparagine (Anastrozole)
- Cysteine (Octreotide)
- Glutamine (Trastuzumab)
- Serine (Adalimumab)
- Threonine (Sulfasalazine)
- Tyrosine (Montelukast)

**Dr Szabo (C04)**
- Citrulline (Metformin)
- GABA (Pioglitazone)
- Isoleucine (Phentermine)
- Ornithine (Orlistat)
- Phenylalanine (Exenatide)
- Sarcosine (Pregabalin)

**Dr Trigatti (C05)**
- Homocysteine (Fingolimod)
- Isovaline (Voroxapar)
- Norleucine (Clopogrel)
- PABA (Pimvaserin)
- Pyrolysine (Propanolol)
- Selenocysteine (Exenatide)

**SCHEDULE:**

**Course Introduction:**
- September 8 - 2:30-3:30 - HSC-1A1
- All students must be present. Introduction, group and task assignments and discussion.
### Progress Meetings and Final Presentation:
Each group will meet with their professor as per the schedule below. Your group needs only show up for the assigned time slots for the progress meetings, but all three groups in each cohort must be present for the Final Presentations. Students may feel free to attend the presentations scheduled in the alternate week.

<table>
<thead>
<tr>
<th>Progress Meeting #1</th>
<th>Progress Meeting #2</th>
<th>Progress Meeting #3</th>
<th>Progress Meeting #4</th>
<th>Final Presentations (All groups must attend.)</th>
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<tbody>
<tr>
<td>Dr Bishop (C01) MDCL-3012</td>
<td>Dr Bishop (C01) MDCL-3012</td>
<td>Dr Bishop (C01) MDCL-3012</td>
<td>Dr Bishop (C01) MDCL-3012</td>
<td>Dr Bishop (C01) MDCL-3020</td>
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<tr>
<td><strong>September 15</strong>&lt;br&gt; 2:30-3:10 - Leucine&lt;br&gt; 3:15-3:55 - Glycine&lt;br&gt; 4:00:4:45 - Alanine</td>
<td><strong>September 29</strong>&lt;br&gt; 2:30-3:10 - Leucine&lt;br&gt; 3:15-3:55 - Glycine&lt;br&gt; 4:00:4:45 - Alanine</td>
<td><strong>October 20</strong>&lt;br&gt; 2:30-3:10 - Leucine&lt;br&gt; 3:15-3:55 - Glycine&lt;br&gt; 4:00:4:45 - Alanine</td>
<td><strong>November 3</strong>&lt;br&gt; 2:30-3:10 - Leucine&lt;br&gt; 3:15-3:55 - Glycine&lt;br&gt; 4:00:4:45 - Alanine</td>
<td><strong>November 17</strong>&lt;br&gt; 2:30-3:10 - Leucine&lt;br&gt; 3:15-3:55 - Glycine&lt;br&gt; 4:00:4:45 - Alanine</td>
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<td>Dr Mullarkey (C02) MDCL-3016</td>
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<td>Dr Mullarkey (C02) MDCL-3016</td>
<td>Dr Mullarkey (C02) MDCL-3016</td>
<td>Dr Mullarkey (C02) MDCL-3022</td>
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<td><strong>September 15</strong>&lt;br&gt; 2:30-3:10 - Arginine&lt;br&gt; 3:15-3:55 - Aspartate&lt;br&gt; 4:00:4:45 - Glutamate</td>
<td><strong>October 6</strong>&lt;br&gt; 2:30-3:10 - Arginine&lt;br&gt; 3:15-3:55 - Aspartate&lt;br&gt; 4:00:4:45 - Glutamate</td>
<td><strong>October 27</strong>&lt;br&gt; 2:30-3:10 - Arginine&lt;br&gt; 3:15-3:55 - Aspartate&lt;br&gt; 4:00:4:45 - Glutamate</td>
<td><strong>November 10</strong>&lt;br&gt; 2:30-3:10 - Arginine&lt;br&gt; 3:15-3:55 - Aspartate&lt;br&gt; 4:00:4:45 - Glutamate</td>
<td><strong>November 24</strong>&lt;br&gt; 2:30-3:10 - Arginine&lt;br&gt; 3:15-3:55 - Aspartate&lt;br&gt; 4:00:4:45 - Glutamate</td>
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<td>Dr Seidlitz (C03) MDCL-3017</td>
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<td>Dr Seidlitz (C03) MDCL-3017</td>
<td>Dr Seidlitz (C03) MDCL-3017</td>
<td>Dr Seidlitz (C03) MDCL-3023</td>
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<td><strong>September 15</strong>&lt;br&gt; 2:30-3:10 - Asparagine&lt;br&gt; 3:15-3:55 - Cysteine&lt;br&gt; 4:00:4:45 - Glutamine</td>
<td><strong>September 29</strong>&lt;br&gt; 2:30-3:10 - Asparagine&lt;br&gt; 3:15-3:55 - Cysteine&lt;br&gt; 4:00:4:45 - Glutamine</td>
<td><strong>October 20</strong>&lt;br&gt; 2:30-3:10 - Asparagine&lt;br&gt; 3:15-3:55 - Cysteine&lt;br&gt; 4:00:4:45 - Glutamine</td>
<td><strong>November 3</strong>&lt;br&gt; 2:30-3:10 - Asparagine&lt;br&gt; 3:15-3:55 - Cysteine&lt;br&gt; 4:00:4:45 - Glutamine</td>
<td><strong>November 17</strong>&lt;br&gt; 2:30-3:10 - Asparagine&lt;br&gt; 3:15-3:55 - Cysteine&lt;br&gt; 4:00:4:45 - Glutamine</td>
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<td>Dr Szabo (C04) MDCL-3413</td>
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<td>Dr Szabo (C04) MDCL-2232</td>
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<td><strong>September 15</strong>&lt;br&gt; 2:30-3:10 - Citrulline&lt;br&gt; 3:15-3:55 - GABA&lt;br&gt; 4:00:4:45 - Isoleucine</td>
<td><strong>September 29</strong>&lt;br&gt; 2:30-3:10 - Citrulline&lt;br&gt; 3:15-3:55 - GABA&lt;br&gt; 4:00:4:45 - Isoleucine</td>
<td><strong>October 27</strong>&lt;br&gt; 2:30-3:10 - Citrulline&lt;br&gt; 3:15-3:55 - GABA&lt;br&gt; 4:00:4:45 - Isoleucine</td>
<td><strong>November 10</strong>&lt;br&gt; 2:30-3:10 - Citrulline&lt;br&gt; 3:15-3:55 - GABA&lt;br&gt; 4:00:4:45 - Isoleucine</td>
<td><strong>November 24</strong>&lt;br&gt; 2:30-3:10 - Citrulline&lt;br&gt; 3:15-3:55 - GABA&lt;br&gt; 4:00:4:45 - Isoleucine</td>
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DEADLINES:

**Journal Article Review:**
- The report for the Journal Article Review must be submitted by **October 16 at 11:59:59pm.**
- Each **group** should also submit the report to Turnitin.com.
- Each **group** is required a digital copy to the '2E03 Journal Article Review' folder on LearnLink.

**Group Evaluations:**
- Located in your professor’s folder on LearnLink:
  - **Midterm:** Due on **October 23 at 11:59:59pm.**
  - **Final:** Due on **December 11 at 11:59:59pm.**

**PowerPoint Final Presentations:**
- Each **group** must submit their PowerPoint for their Final Presentation to the '2E03 Final Presentation' folder on LearnLink by **11:59:59am on the day of your presentation.**

**LOSING MARKS:**

There is a popular notion that students start with a 100% and LOSE marks. We do not subscribe to that notion. You start with ZERO and start accumulating them. We will give you comments but once a mark has been given, we will not change it UNLESS there is a calculating error. Changing a mark for one student is quite unfair, since it penalises the ones who have not come forward for whatever reason. We will not entertain ANY discussions on that score. If you feel strongly that the mark you have received is not appropriate, you will follow the official procedures to have your marks reassessed. If you have questions regarding this, please speak with the Coordinator.

**WRITTEN WORK AND REFERENCING STYLE:**

All written work will be marked on grammar, spelling, clarity of writing and organisation, as well as content and analysis. More details about the marking scheme are posted on the course website. All written work must be properly referenced. Use the Vancouver style for all referencing in this course. Guidelines can be found at: https://www.imperial.ac.uk/media/imperial-college/administration-and-support-services/library/public/vancouver.pdf
ACADEMIC INTEGRITY:

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on course work, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at http://www.mcmaster.ca/academicintegrity.

The following illustrates only three forms of academic dishonesty:
1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorised aids in tests and examinations.

In this course we will be using a web-based service (Turnitin.com) to reveal plagiarism. Students will be expected to submit their work electronically to Turnitin.com and in hard copy so that it can be checked for academic dishonesty. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the professor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to www.mcmaster.ca/academicintegrity.

LEARNLINK:

In this course we will be using LearnLink. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster email accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the Coordinator.

MODIFICATIONS TO COURSE OUTLINE AND EMAIL COMMUNICATION:

The Professors/Coordinator and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes. We will make announcements in class and by using LearnLink. Please note that all emails sent to the course professors must originate from your official McMaster University email account or LearnLink.

ASSIGNMENT DEADLINES AND MISSED OR LATE WORK:

Students are expected to hand in all assignments on the specified due dates. Late submissions will be subject to a penalty of 20% per day (including weekends). Assignments submitted after class on the due date will be counted as one day late.

MCMASTER STUDENT ABSENCE FORM (MSAF):
This is an online, self-reporting tool for students to report absences due to minor medical situations that last up to 3 days and to request accommodation for any missed academic work that is worth less than 25% of the final grade. Please note that this tool cannot be used during any final examination period. It is the prerogative of the Professors/Coordinator to determine the appropriate relief for missed term work. You may submit a maximum of one request per term. The form should be filled out immediately when you are about to return to class after your absence. It is your responsibility to follow up with your professor immediately (within 2 working days) about the nature of the accommodation. If you are absent for more than 3 days, have missed academic work worth 25% or more, or exceed one request per term, you must see someone in the BHSc (Honours) Program office in MDCL-3308. You will be required to provide supporting documentation. All MSAFs should go to the Coordinator.

**ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES:**

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone x28652 or email sas@mcmaster.ca. For further information, consult McMaster University’s Policy for Academic Accommodation of Students with Disabilities.

**SUSTAINABILITY AND WRITTEN WORK:**

The written work submission guidelines for this course have been chosen to support the more sustainable use of paper, energy and toner. Four levels of criteria have been developed by the Office of Sustainability and encouraged for adoption by professors and faculties. The submission guidelines for this course meet the Platinum standard. All written work must be submitted in the following format: reduced line spacing, sans-serif font, and online submission and return. For more information about criteria for sustainable written work submissions, visit the Office of Sustainability website: www.mcmaster.ca/sustainability.