PHYS*3080 Energy
Winter 2018
Section: DE

Department of Physics
Credit Weight: 0.50

Course Details

Calendar Description

This course covers energy resources and the production, transmission, interconversion, consumption and waste of energy in the industrial society. Emphasis is placed on environmental impact and human safety. Topics include fossil fuels, nuclear fission and fusion, wind and solar power, the hydrogen economy, and conservation strategies.

Pre-Requisite(s): IPS*1500 or [(PHYS*1000 or PHYS*1080), (1 of MATH*1000, MATH*1080, MATH*1200)], (1 of IPS*1510, PHYS*1010, PHYS*1070, PHYS*1130)

Co-Requisite(s): None

Restriction(s): None

Method of Delivery: Online

Final Exam

Date: Tuesday, April 17, 2018
Time: 7:00 pm ET to 9:00 pm ET
Location: On campus
Instructional Support

Instructor

Ralf Gellert
Email: rgellert@uoguelph.ca
Telephone: (519) 824-4120 Ext. 53992
Office: MacNaughton Room 450

I'm an experimental Physicist and faculty member in the department of Physics since 2005. I got my MSc and PhD in Physics from the Technical University in Darmstadt, Germany, working in the field of Moessbauer-spectroscopy.

Over the last ~20 years I've been working on building, developing and operating instruments that use nuclear physics methods to explore the surface of Mars. I've been involved in the chemical analysis instrument called APXS and the Moessbauer spectrometer on the Mars Exploration Rovers Spirit and Opportunity. In 2012 the new and improved Canadian APXS landed successfully on Mars, which was developed and built in collaboration with the Canadian Space Agency and the industrial partner MDA.

Together with my group of post-docs and students here in Guelph I support the daily operations of the APXS in collaboration with the NASA team that runs the rovers Opportunity and Curiosity.

Teaching Assistant(s)

Name: TBA
Email: TBA

Learning Resources

Required Textbook

Title: Energy, Physics and the Environment
Author(s): E. L. McFarland, J. L. Hunt and J. L. Campbell
Publisher: Cengage
ISBN: 9781426624339

You may purchase the textbook at the Guelph Campus Co-op Bookstore or the University of Guelph Bookstore. Please note that DE textbooks are located in the Distance Education section of the University of Guelph Bookstore.

https://guelphcampus.coop/bookstore
http://www.bookstore.uoguelph.ca/
Course Website

CourseLink (powered by D2L’s Brightspace) is the course website and will act as your classroom. It is recommended that you log in to your course website every day to check for announcements, access course materials, and review the weekly schedule and assignment requirements.

https://courselink.uoguelph.ca/shared/login/login.html

Ares

For this course, you will be required to access course reserve materials through the University of Guelph McLaughlin Library. To access these items, select Ares on the navbar in CourseLink. Note that you will need your Central Login ID and password in order to access items on reserve.

For further instructions on accessing reserve resources, visit How to Get Course Reserve Materials.

If at any point during the course you have difficulty accessing reserve materials, please contact the e-Learning Operations and Reserve Services staff at:

Tel: 519-824-4120 ext. 53621
Email: libres2@uoguelph.ca
Location: McLaughlin Library, First Floor, University of Guelph

http://www.lib.uoguelph.ca/find/find-type-resource/course-reserves-ares/how-get-course-reserve-material

Learning Outcomes

Course Learning Outcomes

Energy resources, energy use, and the resulting local and global environmental and health impacts are of enormous importance in today’s world. Very often the discussion in the public by politicians, by the media, and by advocates of a wide range of alternative energy sources lacks recognition of the underlying scientific basis, and is frequently devoid of useful numbers.

This course will build on what you have already learned in first-year university math, physics, and chemistry to develop a solid understanding of energy basics that can be applied to your personal as well as global energy consumption.

By the end of the course, you should be able to:

1. Describe common energy resources, electrical power generation and its distribution;
2. Analyze the issues related to each energy source regarding environmental and health impact;
3. Describe the underlying physics of the discussions about global warming, nuclear power, renewable energy resources and energy conservation; and
4. Solve numerical problems related to all the discussed issues.

Teaching and Learning Activities

Method of Learning

Physics is about the solving of problems. You learn the concepts and then you use these concepts to solve problems. Being quantitative is paramount, especially in this course. One cannot have a useful discussion of the huge energy problems that challenge humankind without invoking numbers; How much oil is left? How much radioactive waste is produced by a nuclear reactor? What land area needs to be given up to solar collectors to supply Nevada’s electricity? This course teaches you to answer such questions and provide numbers.

Course Structure

The course is divided into 13 units:

- Unit 01: Elementary physics, units, energy consumption, fossil fuels and resource modeling
- Unit 02: Heat and Thermodynamics
- Unit 03: Health and environmental impacts of fossil fuels
- Unit 04: Electromagnetic radiation and the greenhouse effect
- Unit 05: Electricity I
- Unit 06: Electricity II
- Unit 07: Nuclear physics
- Unit 08: Nuclear energy I
- Unit 09: Nuclear energy II
- Unit 10: Renewable energy I
- Unit 11: Renewable energy II
- Unit 12: Energy use and new technologies
- Unit 13: The automobile
What to Expect for Each Unit

Each unit starts with a brief introduction, followed by a list of learning objectives. “What Do You Think?” is a set of questions to ascertain if any possible misconceptions need to be addressed before you move into studying the material. You can check your knowledge at the end of the unit with the same questions in “What Do You Think Now?”. The main body of the unit will have several sections, each of which contains reading lists from the textbook, solutions to example problems, lists of problems that you should attempt to solve, and sometimes additional reading material.

Schedule

It is strongly recommended that you follow the course schedule provided below. The schedule outlines what you should be working on each week of the course and lists the important due dates for the assessments. By following the schedule, you will be better prepared to complete the assessments and succeed in this course.

Unit 01: Elementary Physics, Units, Energy Consumption, Fossil Fuels and Resource Modeling

Week 1 – Monday, January 8 to Sunday, January 14

General Activities

- Familiarize yourself with the course website by selecting Start Here on the navbar.

- Review Outline and Assessments on the course website to learn about course expectations, assessments, and due dates.

- Confirm your access to the course reserve materials by selecting Ares on the navbar.

Assessments

- Start Assignment 1 (covering units 1 and 2)
  Available: Wednesday, January 10
  Due: Wednesday, January 24 at 11:59 pm ET (Week 3)

Topics

- A. Sources of Energy
  - Read: Sections 1-1 to 1-2

- B: Units of Energy and Power
  - Read: Sections 1.3 and 1.5
  - Exercises:1-1 to 1-7
- Activities: SPS Problem 1-9
- Problems 1-8 and 1-10

- C: Energy Consumption (Recent and Present)
  - Read: Sections 1-4, 1-6, and 2-1
  - Activities: Use data sources to check entries figure 2-1 and extend figure 2-2

- D: Simple Models of Future Energy Consumption
  - Read: Sections 2.2 to 2.7
  - Activities: Work through Examples 2-1 to 2-5
  - Exercises: 2-1 to 2-5
  - Problems: 2-6 to 2-9

- E: Hubbert’s Model of Resource Production and Consumption
  - Read: Sections 3-1, 3-2, remainder of chapter 3, remainder of supplement
  - Activities: Work through examples 3-1 and 3-2
  - Problems: 3-3 to 3-5

**Unit 02: Heat and Thermodynamics**

**Week 2 – Monday, January 15 to Sunday, January 21**

**Assessments**

- Continue working on **Assignment 1** (covering units 1 and 2)
  - Due: Wednesday, January 24 at 11:59 pm ET (Week 3)

**Topics**

- A. Temperature and Specific Heat
  - Read: Section 4.1 to Table 4-1
  - Activities: Watch two short films on Charles Law and calculate the specific heat of water

- B. Latent Heat
• C. Thermodynamics
  o Activity: Watch video the 2nd Law of Thermodynamics
  o Read: Section 4.3, 4.4, 4.5
  o Problems: 4-3, 4-8, 4-9, 4-17
• D. Heat Engines and Refrigerators
  o Read: Section 4.6, 4.7, 4.8, 4.9
  o Activity: Solution with commentary: problem 4-9 on page 4-19 of textbook.
  o Problems: 4-4 to 7, 4-10, 4-11, 4-13, 4-15, 4-17
  o Activity: SPS Problem 4-16

Unit 03: Health and Environmental Impacts of Fossil Fuels

Week 3 – Monday, January 22 to Sunday, January 28

Assessments
• Submit Assignment 1 (covering units 1 and 2)
  Due: Wednesday, January 24 at 11:59 pm ET (Week 3)
• Start Assignment 2 (covering units 3 and 4)
  Available: Wednesday, January 24
  Due: Wednesday, February 7 at 11:59 pm ET (Week 5)

Topics
• A. Extraction, Transport, and Refining
  o Read: Section 5.1
• B. Thermal Pollution of Water Bodies
  o Read: Sections 5.2, 5.3
  o Activity: Solution with commentary: Problem 5-10
  o Problems: 5-1, 2, 9, 10, 11, 12
  o Activity: SPS Problem: 5-13
• C. Air Pollution
  o Read: Section 5.4
• Read: United States Environmental Protection Agency’s Office of Air Quality Planning and Standards website

• Read: Environment Canada's website listing annual emissions of the major air pollutants by province and for the country as a whole and Criteria Air Contaminants (National: 1985-2009)

• Problems: 5-3, 4, 5, 6, 7, 8, 14, 15, 16

• D. Impacts of Air Pollution on Human Health
  o Read: Section 5.5 and the relevant portion of the Supplement

• E. Reduction of Air Pollution
  o Read: Section 5.6 and the Clean Air Act of 1974 plus subsequent additions from the USEPA’s Office of Air Quality Planning and Standards website.

Unit 04: Electromagnetic Radiation and the Greenhouse Effect

Week 4 – Monday, January 29 to Sunday, February 4

Assessments
• Continue working on Assignment 2 (covering units 3 and 4)
  Due: Wednesday, February 7 at 11:59 pm ET (Week 5)

Topics
• A. The Electromagnetic Spectrum and the Inverse Square Law
  o Read: Sections 6.1 and 6-2
  o Activities: SPS Problem: 6-6, 10
  o Problems: 6-1 to 3, 6-6 to 6-8

• B. Blackbody Radiation, Stefan’s and Planck’s Laws and the Radiation from the Sun
  o Read: Section 6.3 and 6.4
  o Problems: 6-4, 6-5, 6-9, 6-10 to 6-16

• C. The Earth’s Greenhouse Effect
  o Read: Section 6.5 to 6.8
  o Activity: Solution with commentary: Problem 6-17
  o Problems: 6-18 to 19
Activity: Go to Youtube.com and search for videos under the category "Greenhouse effect". Play any of them you like and see how many mistakes there are in the explanations.

- D. Long-Term Consequences of the Greenhouse Effect
  - Read: Sections 6.9 and 6.10

Unit 05: Electricity I

Week 5 – Monday, February 5 to Sunday, February 11

Assessments

- Submit Assignment 2 (covering units 3 and 4)
  Due: Wednesday, February 7 at 11:59 pm ET (Week 5)

- Start Assignment 3 (covering unit 5 and the first part of Unit 6 and textbook chapter 8)
  Available: Wednesday, February 7
  Due: Wednesday, February 28 at 11:59 pm ET (Week 7)

Topics

- A. Electric Charge and Current
  - Read: Sections 7.1 and 7-2
  - Problems: 7-6 to 7-7

- B. Electric Potential Energy and Potential
  - Read: Section 7.3
  - Problems: 7-1 to 7-5

- C. Electric Current, Resistance, and Resistivity
  - Read: Section 7.4
  - Activity: Use applet that illustrates the difference between resistance and resistivity.
  - Problem: 7-10

- D. Simple Electric Circuits and Resistor Combination Rules
  - Read: Section 7.5
  - Sample Problem: 7-5
  - Problems: 7-8, 11, 12, 15
• E. Electric Power
  o Read: Section 7.6
  o Sample Problem: 7-8 is particularly important.
  o Activity: SPS Problem 7-16
  o Activity: Solution with commentary Problem 7-18
  o Problems: 7-9, 13, 14, 16 to 21.

• F. Batteries and Fuel Cells
  o Read: Text: Section 7.7
  o Problems: 7-22
  o Activity: Learn How Fuel Cells Work

**Unit 06: Electricity II**

**Week 6 – Monday, February 12 to Sunday, February 18**

**Assessments**

• Continue working on **Assignment 3** (covering unit 5 and the first part of Unit 6 and textbook chapter 8)
  Due: Wednesday, February 28 at 11:59 pm ET (Week 7)

**Topics**

• A. Magnetism and Electromagnetism
  o Read: Sections 8.1 and 8.2
  o Problems: 8-1 and 8-2

• B: Electromagnetic Induction
  o Worked Example 8-2
  o Read: Section 8.3
  o Problems: 8-3, 8-10 to 8-12
  o Activity: Use applet about the Magnetic (or Lorentz) force.
  o Activity: Use applet about how the Lorentz force is arranged to make a DC motor.

• C. Electric Current, Resistance, and Resistivity
Read: Section 8.4, 8.5 and 8.6
Problems: 8-4 to 8-9 and 8-13 to 8-15
Activity: An SPS activity on RMS values

D. Commercial Electricity
Read: Chapter 9
Problems: 9-1, 9-2

Winter Break: Monday, February 19 to Sunday, February 25

Unit 07: Nuclear Physics

Week 7 – Monday, February 26 to Sunday, March 4

Assessments
- Submit Assignment 3 (covering unit 5 and the first part of Unit 6 and textbook chapter 8)
  Due: Wednesday, February 28 at 11:59 pm ET (Week 7)
- Start Assignment 4 (covering units 7 & 8)
  Available: Wednesday, February 28
  Due: Wednesday, March 14 at 11:59 pm ET (Week 9)

Topics
- A. Structure and Stability of Atomic Nuclei
  Read: Sections 10.1 – 10.3
  Exercises: 10-2, 10-3, 10-4
- B. Radioactivity
  Read: Section 10.4, 10.5
  Work Through: Examples 10-1 to 10-3
  Activity: Problem solution with commentary: Problem 10-9
  Exercises: 10-5 and 10-6.
  Activity: SPS Problem 10-10
- C. Nuclear Reactions
  Read: Section 10.6
D. Nuclear Binding Energy

- Read: Section 10.7
- Work Through: Example 10-5
- Problems: 10-17 through 10-23

E. Nuclear Fission

- Watch: YouTube animation “Fission and fusion”
- Read: Section 10.8
- Work Through: Example 10-7

**Unit 08: Nuclear Energy I**

**Week 8 – Monday, March 5 to Sunday, March 11 (40th Class Day: Friday, March 9)**

**Assessments**

- Continue working on Assignment 4 (covering units 7 & 8)
  Due: Wednesday, March 14 at 11:59 pm ET (Week 9)

**Topics**

- **A. The Three Basic Components of a Nuclear Reactor**
  - Read: Section 11.1 and supplement this via the website of the Canadian Nuclear Association (CNA)

- **B. Light Water Reactors**
  - Read: Section 11.2, and again, supplement the textbook via the CNA website; navigate as above but finally choose “Major reactor types”.
  - Watch: Two YouTube videos:
    - a) “How a nuclear reactor works” from Equinox Graphics, and
    - b) “Pressurised water reactor” by mckuyver
  - C. Heavy Water Reactors
    - Read: Section 11.3 and supplement with the CNA website; navigate as above but choose “The Candu reactor”.

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• D. Radio Activity
  o Read: Section 11.4 and supplement this via the CNA website; navigate as above but choose “Major reactor types”

• E. Breeder Reactors
  o Read: Section 11.5

• F. Reactor Control and Stability
  o Read: Section 11.6 and the link provided
  o Problem: 11-1 G. Reactor Safety
  o Read: Section 11.7
  o Activity: Click link to see if you can run the Chernobyl Reactor.

• H. Uranium Resources
  o Read: Section 11.8 and the World Nuclear Association website http://www.world-nuclear.org/info/inf75.html for a 2009 overview using data from the international Energy Agency

• I. The Nuclear Fuel Cycle
  o Read: Section 11.9 and the website of the Canadian Nuclear Association (CNA).
  o Problems: 11-2 through 11-8.
  o Activity: Solution with commentary: Problem 11-2

Unit 09: Nuclear Energy II

Week 9 – Monday, March 12 to Sunday, March 18

Assessments
• Submit Assignment 4 (covering units 7 & 8)
  Due: Wednesday, March 14 at 11:59 pm ET (Week 9).

• Start Assignment 5 (covering units 9, 10 & 11)
  Available: Wednesday, March 14
  Due: Wednesday, April 4 at 11:59 pm ET (Week 12)

Topics
• A. Radiation Transport and Radiation Protection
  o Read: Section 12.1
- Problems: 12-1, 12-2, 12-3, 12-4

- B. Radiation Sources and Radiation Dose
  - Read: Sections 12.2 through 12.4 plus Supplementary PDF
  - Activity: Solution with commentary: Problem 12-6
  - Problems: 12-5, 12-6, 12-7

- C. Effects of Nuclear Radiation on Human Health
  - Read: Section 12.5 plus Supplementary PDF
  - Problems: 12-8, 12-9, 12-10

- D. Uranium Mining and Processing
  - Read: Section 12.6 plus supplement this via the website of the Canadian Nuclear Association (CNA)
  - Click on Educational Resources, then on Nuclear Technology at Work, then on both “Uranium Mining” and “Uranium Processing”.
  - Problem: 12-11

- E. Reactor Emissions and Long-Term Waste
  - Read: Section 12.7 plus supplement this via the website of the Canadian Nuclear Association (CNA).
  - Problem: 12-12

- F. Nuclear Accidents: Reasons and Consequences
  - Read: Section 12.8 plus the IAEA’s report on the health and environmental consequences of Chernobyl

- G. The End of the First Nuclear Era
  - Read: Section 13.1 plus consult this list from the World Nuclear Association to see in more detail which countries are operating reactors or constructing/planning new ones.

- H. Generation 3: Improved Operating, Better Safety
  - Read: Section 13.2 plus look at this example of these new passive safety features.

- I. Large Generation 3 Reactors
  - Read: Section 13.3
• J. Small Generation 3 Reactors - A New Concept – The Pebble-Bed Reactor
  o Read: Section 13.4
• K. New Ventures with Breeder Reactors
  o Read: Section 13.5
• L. Spent Fuel – Store It or Re-Process It?
  o Read: Section 13.6 plus Canadian Nuclear Association (CNA) website

**Unit 10: Renewable Energy I**

**Week 10 – Monday, March 19 to Sunday, March 25**

**Assessments**
• Continue working on **Assignment 5** (covering units 9, 10 & 11)
  Due: Wednesday, April 4 at 11:59 pm ET (Week 12)

**Topics**
• A. Introduction to Wind Energy
  o Read: Sections 6.1 and 6-2
• B. The Basic Physics of Wind Turbines
  o Read: Text: Sections 14.2, 14.3
  o Read: Wind Supplement, (pages 1 and 2)
  o Exercise: Work through Example 14-1
• C. Wind: Location, Location, Location
  o Read: Section 14.4 – about wind speeds and the Weibull Distribution.
  o Read: Wind Supplement sections on wind speed and direction.
  o Read: The Wind Rose website
  o Exercises and Problem: Exercises 14-1 and 14-3, and Problem 14-4
• D. Wind: Modern Design, Environmental Issues
  o Read: Sections 14.7 and 14.8 plus the Wind Supplement
• E. Wind: Progress, Costs and Problems
- Read: Sections 6.1 and 6-2

- F. Tidal Energy
  - Read: Section 14.9 plus the website of the Marine Current Turbines company
  - Problem: 14-5

- G. Wave Energy

- H. Geothermal Energy
  - Read: Section 14-11
  - Read: Geothermal Power Supplement
  - Problem: 4-2

**Unit 11: Renewable Energy II**

**Week 11 – Monday, March 26 to Thursday, March 29**

**Assessments**
- Continue working on **Assignment 5** (covering units 9, 10 & 11)
  Due: Wednesday, April 4 at 11:59 pm ET (Week 12)

**Topics**
- A. Introduction to Solar Energy
  - Read: Section 15.1
  - Refresh: Sections 6.5 – 6.7
  - Exercise: See details in course website
  - Read: Fixed Collector link

- B. Small-Scale Direct Collection of Solar Energy
  - Read: Section 15.2. Augment this via the McGill University School of Architecture website.
  - Exercise: Work through example 15-2
  - Problems: 15-4 through 15-7.

- C. Large-Scale Direct Collection of Solar Energy
• D. Direct Conversion of Solar Energy to Electricity
  o Read: Section 15.4 plus Solar supplement
  o Read: Description of the large Amareleja solar photo-voltaic plant in Portugal.
  o Problem: 15-2

• E. Biomass
  o Read: Section 15.5 plus the Biomass Supplement.
  o Activity: Watch problem 15-5 solution with commentary

Unit 12: Energy Use and New Technologies

Week 12 – Friday, March 30 to Tuesday, April 3

Assessments
• Continue working on Assignment 5 (covering units 9, 10 & 11)
  Due: Wednesday, April 4 at 11:59 pm ET (Week 12).

Topics
• A. Heat Transfer by Conduction
  o Read: Text: Section 16.1 and 16.2.
  o Activity: Watch a short video that uses Equation. 16-2 to measure the thermal conductivity of copper.
  o Problems: 16-1, 2, 5, 6, 8, 9

• B. Heat Transfer by Convection and the Conductive-Convective Layer
  o Activity: Watch a demonstration of convection in a fluid.
  o Read: Section 16.3 and 16.4
o Problems: 16-7, 16-10, 16-11
o Activity: Watch Problem 16-10 solution with commentary.

- C. Efficiency vs. Conservation
  o Read: Section 16.6, 16.7, 16.8, 16.9, 16-10
  o Problem: 16-13

- D. Energy Currencies
  o Read: Section 18.1, 18.2
  o Problems: 18-1 to 18-5

- E. New Technologies
  o Read: Section 18.5, 18.6
  o Activity: Watch two films

**Unit 13: The Automobile**

**Week 12 – Wednesday, April 4 to Friday, April 6**

**Assessments**

- Submit **Assignment 5** (covering units 9, 10 & 11)
  Due: Wednesday, April 4 at 11:59 pm ET (Week 12)

**Topics**

- A. The Otto Cycle and Other Cycles
  o Read: Section 17.1 up to Eq. [17-4].
  o Activity: Use a simulation demonstrating how the Otto Cycle operates.
  o Activity: Use a simulation demonstrating how the Diesel Cycle operates.
  o Activity: Complete the table about the six episodes in the Otto cycle
  o Problems: 17-1 to 17-4
  o Explain the meaning of thermal efficiency, fuel input power, indicated power

- B. Improving the Thermal Efficiency of the Otto Engine
  o Read: Section 17-1 from Equation 17-4 to the end. Example 17-1 is particularly important
- Problems: 17-7 to 17-11
- Activity: Problem 17-12 solution with audio commentary
- Activity: SPS Problem 17-7

- C. Fuel Combustion and Emission Control
  - Read: Section 17-2
  - Activity: Watch a video about catalytic converters

- D. Alternatives to the Fossil Fuelled Engine
  - Activity: Watch a video about a steam powered car.

- E. Storage Batteries and the Electric Carhnologies
  - Read: Section 17.3 and 17.4
  - Problems: 17-12, 13, and 15.
  - Activity: Problem 17-12 solution with audio commentary
  - Example problem 17-15

- F. The Hybrid Car
  - Read: Section 17.5 and 17.6
  - Refresher: pp 7-13, 14

- G. Conservation in Transportation
  - Read: Section 17.7
  - Problems: 17-14

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**Assessments**

The grade determination for this course is indicated in the following table. A brief description of each assessment is provided below. Select **Content** on the navbar to locate **Assessments** in the table of contents panel to review further details of each assessment. Due dates can be found under the Schedule heading of this outline.
Table 1: Course Assessments

<table>
<thead>
<tr>
<th>Assessment Item</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Problem Assignments (5 x 10%)</td>
<td>50%</td>
</tr>
<tr>
<td>Final Examination</td>
<td>50%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Note:** In order to pass this course, you must have a passing mark on both the overall grade and the final exam. If you score less than 50% in the final, you will be awarded a maximal final grade of 45%, even if your total score is above 50%.

**Assessment Descriptions**

**Written Problem Assignments**

There will be five assignments during the semester. The instructor will post the problems online in the **Announcements** section according to the Schedule found in this Outline. You are expected to submit your solutions before the deadline using the **Dropbox** (found under the Tools dropdown menu in the course navbar). Some problems from the textbook may be assigned, and others will be at similar levels of difficulty.

**Final Exam**

This course requires you to write a traditional sit-down final exam. Final exams are written on campus at the University of Guelph or at alternate locations for students at a distance. The final exam will have two sections:

- Part A (weight 40%): several questions that ask you to explain concepts
- Part B (weight 60%): problems similar to the ones in assignments, which require analytical and/or mathematical reasoning.

In Part B, you will be allowed to use your textbook.

It is assumed that all DE students will be writing their final examination on campus at the University of Guelph. University of Guelph degree and associate diploma students must check **WebAdvisor** for their examination schedule. Open Learning program students must check the **Open Learning Program Final Examination Schedule** for their examination schedule.

If you are studying at a distance, you can request to write your final exam at an alternate location. It is recommended that you make arrangements as early as possible in the semester since changes cannot be guaranteed after the deadline. Exam schedules for off-campus exams will be emailed by Week 9 of the course. For more information, please visit **Final Exams**.
Course Technologies and Technical Support

CourseLink System Requirements

You are responsible for ensuring that your computer system meets the necessary system requirements. Use the browser check tool to ensure your browser settings are compatible and up to date. (Results will be displayed in a new browser window).

Technical Skills

As part of your online experience, you are expected to use a variety of technology as part of your learning:

- Manage files and folders on your computer (e.g., save, name, copy, backup, rename, delete, and check properties);
- Install software, security, and virus protection;
- Use office applications (e.g., Word, PowerPoint, Excel, or similar) to create documents;
- Produce PDF files to upload assignments to Dropbox;
- Be comfortable uploading and downloading saved files;
- Communicate using email (e.g., create, receive, reply, print, send, download, and open attachments);
- Navigate the CourseLink learning environment and use the essential tools, such as Dropbox, Quizzes, Discussions, and Grades (the instructions for this are given in your course);
- Access, navigate, and search the Internet using a web browser (e.g., Firefox, Internet Explorer); and
- Perform online research using various search engines (e.g., Google) and library databases.
Course Technologies

Ares

The library’s Ares Course Reserve system is a software solution that provides you with access to digital resources used in your course. The system also provides information on print resources placed at the physical reserve desk at the library. Accessibility and privacy policy statements do not exist for this software.

CourseLink

Distance Education courses are offered entirely online using CourseLink (powered by D2L's Brightspace), the University of Guelph's online learning management system (LMS). By using this service, you agree to comply with the University of Guelph’s Access and Privacy Guidelines. Please visit the D2L website to review the Brightspace privacy statement and Brightspace Learning Environment web accessibility standards.

http://www.uoguelph.ca/web/privacy/
https://www.d2l.com/legal/privacy/
https://www.d2l.com/accessibility/standards/

Technical Support

If you need any assistance with the software tools or the CourseLink website, contact CourseLink Support.

CourseLink Support
University of Guelph
Day Hall, Room 211
Email: courselink@uoguelph.ca
Tel: 519-824-4120 ext. 56939
Toll-Free (CAN/USA): 1-866-275-1478

Walk-In Hours (Eastern Time):
Monday thru Friday: 8:30 am–4:30 pm

Phone/Email Hours (Eastern Time):
Monday thru Friday: 8:30 am–8:30 pm
Saturday: 10:00 am–4:00 pm
Sunday: 12:00 pm–6:00 pm

Course Specific Standard Statements

Acceptable Use

The University of Guelph has an Acceptable Use Policy, which you are expected to adhere to.
Communicating with Your Instructor

During the course, your instructor will interact with you on various course matters on the course website using the following ways of communication:

- **Announcements**: The instructor will use Announcements on the Course Home page to provide you with course reminders and updates. Please check this section frequently for course updates from your instructor.

- **Ask Your Instructor Discussion**: Use this discussion forum to ask questions of your instructor about content or course-related issues with which you are unfamiliar. If you encounter difficulties, the instructor is here to help you. Please post general course-related questions to the discussion forum so that all students have an opportunity to review the response. To access this discussion forum, select Discussions from the Tools dropdown menu.

- **Email**: If you have a conflict that prevents you from completing course requirements, or have a question concerning a personal matter, you can send your instructor a private message by email. The instructor will respond to your email within 48 to 72 hours.

Netiquette Expectations

For distance education courses, the course website is considered the classroom and the same protections, expectations, guidelines, and regulations used in face-to-face settings apply, plus other policies and considerations that come into play specifically because these courses are online.

Inappropriate online behaviour will not be tolerated. Examples of inappropriate online behaviour include:

- Posting inflammatory messages about your instructor or fellow students;
- Using obscene or offensive language online;
- Copying or presenting someone else’s work as your own;
- Adapting information from the Internet without using proper citations or references;
- Buying or selling term papers or assignments;
- Posting or selling course materials to course notes websites;
- Having someone else complete your quiz or completing a quiz for/with another student;
- Stating false claims about lost quiz answers or other assignment submissions;
- Threatening or harassing a student or instructor online;
- Discriminating against fellow students, instructors, and/or TAs;
• Using the course website to promote profit-driven products or services;
• Attempting to compromise the security or functionality of the learning management system; and
• Sharing your username and password.

Submission of Assignments to Dropbox

All assignments for this course are to be submitted electronically via the online Dropbox tool. When submitting your assignments using the Dropbox tool, do not leave the page until your assignment has successfully uploaded. To verify that your submission was complete, you can view the submission history immediately after the upload to see which files uploaded successfully. The system will also email you a receipt. Save this email receipt as proof of submission.

Be sure to keep a back-up copy of all of your assignments in the event that they are lost in transition. In order to avoid any last-minute computer problems, it is strongly recommended that you save your assignments to a cloud-based file storage (e.g., Google Docs), or send to your email account, so that should something happen to your computer, the assignment could still be submitted on time or re-submitted.

It is your responsibility to submit your assignments on time as specified on the Schedule. Be sure to check the technical requirements and make sure you have the proper computer, that you have a supported browser, and that you have reliable Internet access. Remember that technical difficulty is not an excuse not to turn in your assignment on time. Don’t wait until the last minute as you may get behind in your work.

If, for some reason, you have a technical difficulty when submitting your assignment electronically, please contact your instructor or CourseLink Support.
http://spaces.uoguelph.ca/ed/contact-us/

Late Policy

If you choose to submit your individual assignments to the Dropbox tool late, the full allocated mark will be reduced by 10% per day after the deadline for the submission of the assignment. Access to the Dropbox folder will be closed typically 2 days after the deadline when the solution of the assignment is posted.

Extensions will be considered for medical reasons or other extenuating circumstances. If you require an extension, discuss this with the instructor as soon as possible and well before the due date. Barring exceptional circumstances, extensions will not be granted once the due date has passed. These rules are not designed to be arbitrary, nor are they inflexible. They are designed to keep you organized, to ensure that all students have the same amount of time to work on assignments, and to help to return marked materials to you in the shortest possible time.
Obtaining Grades and Feedback

Unofficial assessment marks will be available in the Grades tool of the course website. Your instructor will have grades posted online within 2 weeks of the submission deadline, if the assignment was submitted on time. Once your assignments are marked you can view your grades on the course website by selecting Grades from the Tools dropdown menu on the navbar. Your course will remain open to you for seven days following the last day of the final exam period.

University of Guelph degree students can access their final grade by logging into WebAdvisor (using your U of G central ID). Open Learning program students should log in to the OpenEd Student Portal to view their final grade (using the same username and password you have been using for your courses).

https://webadvisor.uoguelph.ca
https://courses.opened.uoguelph.ca/portal/logon.do?method=load

Rights and Responsibilities When Learning Online

For distance education (DE) courses, the course website is considered the classroom and the same protections, expectations, guidelines, and regulations used in face-to-face settings apply, plus other policies and considerations that come into play specifically because these courses are online.

For more information on your rights and responsibilities when learning in the online environment, visit Rights and Responsibilities.

http://opened.uoguelph.ca/student-resources/rights-and-responsibilities

University Standard Statements

University of Guelph: Undergraduate Policies

As a student of the University of Guelph, it is important for you to understand your rights and responsibilities and the academic rules and regulations that you must abide by.

If you are a registered University of Guelph Degree Student, consult the Undergraduate Calendar for the rules, regulations, curricula, programs and fees for current and previous academic years.

If you are an Open Learning Program Student, consult the Open Learning Program Calendar for information about University of Guelph administrative policies, procedures and services.

https://www.uoguelph.ca/registrar/calendars/undergraduate/current/
http://opened.uoguelph.ca/student-resources/open-learning-program-calendar
Email Communication

University of Guelph Degree Students

As per university regulations, all students are required to check their uoguelph.ca e-mail account regularly: e-mail is the official route of communication between the University and its students.

Open Learning Program Students

Check your email account (the account you provided upon registration) regularly for important communications, as this is the primary conduit by which the Open Learning and Educational Support will notify you of events, deadlines, announcements or any other official information.

When You Cannot Meet Course Requirements

When you find yourself unable to meet an in-course requirement due to illness or compassionate reasons, please advise your course instructor in writing, with your name, ID number and email contact.

University of Guelph Degree Students

Consult the Undergraduate Calendar for information on regulations and procedures for Academic Consideration.

https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Open Learning Program Students

Please refer to the Open Learning Program Calendar for information on regulations and procedures for requesting Academic Consideration.

http://opened.uoguelph.ca/student-resources/open-learning-program-calendar

Drop Date

University of Guelph Degree Students

The last date to drop one-semester courses, without academic penalty, is indicated on the Schedule section of this course outline. Review the Undergraduate Calendar for regulations and procedures for Dropping Courses.

https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Open Learning Program Students

Please refer to the Open Learning Program Calendar.

http://opened.uoguelph.ca/student-resources/open-learning-program-calendar
Copies of Assignments

Keep paper and/or other reliable back-up copies of all assignments: you may be asked to resubmit work at any time.

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment.

University of Guelph Degree Students

Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact Accessibility Services as soon as possible.

For more information, contact Accessibility Services at 519-824-4120 ext. 56208, email Accessibility Services or visit the Accessibility Services website.

accessibility@uoguelph.ca
https://wellness.uoguelph.ca/accessibility/

Open Learning Program Students

If you are an Open Learning program student who requires academic accommodation, please contact the Academic Assistant to the Director. Please ensure that you contact us before the end of the first week of your course (every semester) in order to avoid any delays in support. Documentation from a health professional is required for all academic accommodations. Please note that all information provided will be held in confidence.

If you require textbooks produced in an alternate format (e.g., DAISY, Braille, large print or eText), please contact the Academic Assistant to the Director at least two months prior to the course start date. If contact is not made within the suggested time frame, support may be delayed. It is recommended that you refer to the course outline before beginning your course in order to determine the required readings.

The provision of academic accommodation is a shared responsibility between OpenEd and the student requesting accommodation. It is recognized that academic accommodations are intended to “level the playing field” for students with disabilities.

jessica.martin@uoguelph.ca

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as
much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar.
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Copyright Notice

Content within this course is copyright protected. Third party copyrighted materials (such as book chapters and articles) have either been licensed for use in this course, or have been copied under an exception or limitation in Canadian Copyright law.

The fair dealing exemption in Canada's Copyright Act permits students to reproduce short excerpts from copyright-protected materials for purposes such as research, education, private study, criticism and review, with proper attribution. Any other copying, communicating, or distribution of any content provided in this course, except as permitted by law, may be an infringement of copyright if done without proper license or the consent of the copyright owner. Examples of infringing uses of copyrighted works would include uploading materials to a commercial third party web site, or making paper or electronic reproductions of all, or a substantial part, of works such as textbooks for commercial purposes.

Students who upload to CourseLink copyrighted materials such as book chapters, journal articles, or materials taken from the Internet, must ensure that they comply with Canadian Copyright law or with the terms of the University's electronic resource licenses.

For more information about students’ rights and obligations with respect to copyrighted works, review Fair Dealing Guidance for Students.
http://www.lib.uoguelph.ca/sites/default/files/fair_dealing_policy_0.pdf

Plagiarism Detection Software

Students should be aware that faculty have 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, up to and including suspension or expulsion from the University can be imposed.
Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.