



**CAMOSUN COLLEGE**  
**School of Arts & Science**  
**Department of Chemistry & Geoscience**

**CHEM-251-001**

**Immunology**  
**Fall 2019**

**COURSE OUTLINE**

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The course description is online @ <http://camosun.ca/learn/calendar/current/web/chem.html>

Ω Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.

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**1. Instructor Information**

<b>(a) Instructor</b>	Jamie Doran, Ph.D.
<b>(b) Office hours</b>	Tuesday, 3:00 PM to 4:00 PM Wednesday, 3:00 PM to 4:00 PM Thursday, 10:00 AM to 11:00 AM Friday, 2:30 PM to 4:30 PM Please make an appointment. Everyone is welcome to contact me by email, including in the evenings and on weekends.
<b>(c) Location</b>	Room 350C, Fisher Building, Lansdowne Campus
<b>(d) Phone</b>	250.370.3441 (voice-mail available)
<b>(e) E-mail</b>	<a href="mailto:jdoran@camosun.ca">jdoran@camosun.ca</a> (monitored evenings and weekends throughout the semester)

**2. Intended Learning Outcomes**

Upon completion of this course the student will be able to:

1. Evaluate fundamental aspects of the human immune system, and relate these to a wide variety of immunologically-based clinical conditions including allergies, transplant rejections, autoimmune diseases, and immunodeficiencies including AIDS.
2. Compare and contrast various types of antibody-based diagnostic tests, and various vaccine formulations.
3. Have hands-on experimental skills required to conduct the most commonly used immunological techniques including enzyme-linked immunosorbent assays (ELISA), latex bead agglutination assays, and Western-blotting detection of antigens.
4. Evaluate experimental design, design control experiments, and interpret data arising from basic immunological technologies.
5. Work in a biosafety level-1 laboratory.
6. Prepare, handle and store many types of solutions, buffers, reagents, and equipment used in immunological experimentation.

**3. Required Materials**

(a) Text

Parham, P. 2015, *The Immune System*. 4<sup>th</sup> ed. Garland Science, New York.

This *required* textbook can be purchased from the Lansdowne Campus book store. Also, a copy of the textbook is available on loan through the Lansdowne campus reserve library.

(b) Other

**Laboratory Manual, Selected Course Notes and Lecture Slides. 2019 Edition.**

This *required* course pack contains the laboratory manual, selected course notes, and lecture slides. It can be purchased from the Lansdowne Campus book store.

**General Materials and Supplies**

Safety glasses Safety glasses *are required* when handling hazardous chemicals, and are recommended when handling laboratory glassware. Each student is required to provide her or his own pair of safety glasses. Students lacking safety glasses when they are required will not be permitted in the laboratory.

Lab coats Lab coats are *required* for all experimental work in the laboratory. Each student is required to provide her or his own lab coat.

Latex gloves Disposable, plastic, 'non-allergenic' gloves *will be available in the laboratory* and are to be used when appropriate to protect the skin from potentially hazardous chemicals or, more typically, to protect biochemicals from degradative enzymes found on the skin.

Calculator A scientific calculator is *required* at times in the laboratory, in lecture, and during term tests and the final exam. Each student is *required* to provide her or his own calculator. Cell phone-based, tablet-based or computer-based calculators cannot be used during term tests or the final exam.

**4. Course Content and Schedule**

Credits	4 credits
In-class workload	6 hours per week
Out-of-class workload	6 hours per week
Number of weeks	14 weeks
Pre-requisite	Chem 120 - College Chemistry 2 (grade of C)

There are three 50-min lectures per week. Term test review periods will be scheduled into an appropriate lecture slot prior to each term test. Experiments, pre-lab talks and lectures & post-lab analyses are conducted during most of the 1 h & 50 min laboratory periods. This time period is also used to host two term tests.

**Course times and locations**

<u>Lectures</u>	Monday, 8:30 - 9:20 AM Fisher Building, Room F360
	Tuesday, 8:30 - 9:20 AM Fisher Building, Room F360
	Thursday, 8:30 - 9:20 AM Fisher Building, Room F360

Laboratory Experiments & Term Test Times *Please see the laboratory and term test schedule.*

Wednesday, 9:30 PM to 12:20 PM  
Fisher Building, Room F360

**Lecture Outline**

**HISTORICAL PERSPECTIVE**

*Reading relevant to this initial lecture material is provided in the 'Selected Course Notes' section of the course pack under the heading 'Historical Perspective on the Field of Immunology' (pages 271 to 277). Much of this information is introduced in The Immune System, 4<sup>th</sup> ed. by Peter Parham. However, it is portioned across several of the chapters often appearing in the introductory sections.*

- Early historical evidence of immunity in humans

- Earliest evidence of the phenomenon of 'immunity'
- Recognition of the four basic tenants of adaptive immunity
- Variolation & the early evidence of vaccination
- Development of Jenner's small pox vaccine
- Development of the field of immunology
  - Louis Pasteur (1860's- 1890's) creates the field of immunology with seminal experiments demonstrating vaccination and acquired immunity in animals and humans.
  - Pasteur and Koch compete to create widely-accepted vaccines.
  - Metchnikoff establishes the field of cellular immunology (1880's)
  - Nuttall (1888) & Von Behring (1888-1890's): humoral immunity
  - Wright (1903): synergy of cellular and humoral immunity.
  - Paul Ehrlich (early 1900's-1915): furtherance of understanding.
  - Border (early 1900's): immune responses to non-pathogenic cells
  - Lansteiner (early 1900's): blood group, ABO antigens.
  - Ramon (1928): toxoids (attenuated chemicals) as vaccines
  - Kabat (1930's): isolated immunoglobulins (antibodies) from blood
  - Chase (1940's): demonstrates transfer of cellular immunology
  - (Note the list of Nobel Prize winning immunologists at the end of the selected notes.)

#### GENERAL ROLE FOR THE IMMUNE SYSTEM IN MAINTAINING BODY INTEGRITY

Reading Chapter 1, sections 1-1, 1-2, 1-5, 1-6, 1-8 and 1-11 to 1-14

- Challenges to health: infectious organisms, cancer, toxins
- Innate immunity 'versus' adaptive immunity
- The lymphatic system (*will be integrated with discussion of innate immunity, below*)
  - Primary and secondary lymphatic tissues
  - Structure and function of the lymphatic system as it relates to immunity
- Primary immune responses vs. secondary immune responses

#### THE INNATE IMMUNE RESPONSE

Reading Chapter 1, sections 1-3, 1-4 & 1-7

Chapter 2, sections 2-1 to 2-8 & 2-9 to 2-11

Chapter 3, sections 3-1 to 3-21

Chapter 9, sections 9-17, 9-18 & 9-19 (on complement)

Chapter 10, sections 10-1 to 10-3

Selected Course Notes, 'Innate Immunity', pages 278 to 285.

Selected Course Notes. 'Complement and Activation of the Classical & Alternative Pathways', pages 286 to 293.

Browse Chapter 12, sections 12-1 to 12-9 to collect more salient information on NK cells.

- General characteristics of nonspecific physical and chemical defenses
  - Physical barriers
    - Skin and mucous membranes
  - Defensive chemicals
    - pH, lysozyme, iron-binding compounds, defensins, & others
  - Natural bacterial flora and microbial antagonism
- White blood cells (leukocytes) involved in innate immunity
  - Phagocytic cell types: monocytes & macrophage, neutrophils (PMN's), dendritic cells, Langerhans cells
  - Nonphagocytic leukocytes: eosinophils, natural killer cells
  - Inflammatory leukocytes: mast cells, basophils
  - Lymphocytes: B-cells and T-cells
  - Origins of myeloid and lymphoid cell lines
- The innate, acute, inflammatory response
  - Constriction and local dilation of vessels
  - Roles for cells and soluble factors from the blood
  - Margination, extravasation (diapedesis), chemotaxis
  - Mast cell activity, soluble mediators
- The process of phagocytosis by macrophage
  - Antigen presentation links innate immunity with adaptive immunity
  - Oxygen-dependent and oxygen-independent killing mechanisms
  - Microbial strategies for the prevention of phagocytic killing
- Cytokines, an Introduction.
  - General nature and characteristics
  - Autocrine and paracrine functions
  - Classic characteristics: pleotrophy, redundancy, synergy, antagonism
- Cytokines, other humoral factors, and cell receptors involved in innate immunity

- Broad picture of cytokine-mediated immunoregulation
- Chemokines
- Interferons  $\alpha$  &  $\beta$  (type 1 IFN)
- Toll-like receptors & other PRRs
- C-reactive protein & other acute phase proteins
- Adhesion molecules
- Complement
  - Classical complement pathway
  - Alternative complement pathway
  - Lectin-mediated complement activation pathway
  - Roles of products of complement activation and other acute phase proteins in the inflammatory response and other aspects of immunity.
- Natural killer (NK) cells
  - Roles in innate immunity
  - Cytotoxic mechanisms
  - Roles in conjunction with adaptive immunity

#### GENERAL NATURE OF ANTIBODIES AND ANTIGENS

*This information will be introduced early in the course in support of laboratory experiments.*

- Basic nature of antibodies
- Antigens, immunogens, and haptens
  - Epitopes (antigenic determinants)
  - Characteristics and properties of immunogens
  - Experimental conditions that affect the immunogenicity of immunogens
  - Vaccination conditions that affect the immunogenicity of immunogens

#### ANTIBODIES - STRUCTURE & DIVERSITY

*Some of this information will be introduced early in the course in support of laboratory experiments.*

*Reading Chapter 4, sections 4-1 to 4-16*

*Browse Chapter 4, section 4-17*

- Antibodies
  - Structure and function of a prototypic, divalent Ab molecule
    - ◇ Fab and Fc fragments
    - ◇ Globular constant domains
    - ◇ Variable and hypervariable (CDR) regions
  - Isotypes (classes) of antibodies
    - ◇ Classes of heavy and light chains
    - ◇ Immunological characteristics and functions
  - Idiotypes
- Genetics of antibody diversity Antibody production by B-cells
  - Multi-gene organization of immunoglobulin genes
  - Variable region gene rearrangements
  - Generation of antibody diversity
  - Class switching
- Monoclonal Antibodies (MAbs) (*material presented in conjunction with MAb labs*)
  - Technical means of producing MAbs
  - Roles of MAbs as drugs
  - Roles of MAbs in drug targeting
  - Roles of MAbs in diagnostics

#### B-CELL ACTIVATION & ANTIBODY EFFECTOR FUNCTIONS

*Reading Chapter 6, Introduction, sections 6-1, 6-2, 6-4, 6-5, & 6-9 to 6-16*

*Chapter 9, sections 9-1, 9-3, 9-4 to 9-6, & 9-8 to 9-16*

*Chapter 10, sections 10-12 to 10-15*

*Browse Chapter 9, sections 9-2, 9-7 & 9-21 to 9-24*

- Development & processing of B-cells
- Antibody production by B-cells
  - Clonal selection and antibody synthesis
  - B-cell receptors and antigen binding
  - B-cell activation and maturation
    - Plasma cells
    - Memory B-cells
  - Affinity maturation
  - Relationship of affinity maturation to class switching
  - Relationship of affinity maturation to memory B-cells

- Antibody effector functions
  - Roles as adaptor molecule
  - Roles specific to classes (isotypes) of antibodies
- Antibody interactions with Fc receptors on macrophage, mast cells, basophils, eosinophils and natural killer (NK) cells.
  - ADCC (antibody-dependent cell-mediated cytotoxicity)
- B-cell Receptors & cell adhesion molecules
- Role of CD4 Helper T<sub>H2</sub>-cells in antibody production
- Role of CD4 Helper T<sub>H2</sub> -cells in CD4 B-cell activation
- T-independent B-cell antigens
- Role of the lymphatic system
- The role of T-helper cell - B-cell interactions
  - Affinity maturation and isotype switching
  - Prevention of harmful effects of affinity maturation

## T-CELL ANTIGEN RECOGNITION AND ACTIVATION, AND T-CELL MEDIATED IMMUNITY

*Reading Chapter 5, Introduction and sections 5-1, 5-2, 5-4, 5-6 to 5-11 & 5-13 to 5-23*

*Chapter 7, Introductions and sections 7-1, 7-8 & 7-10 to 7-14*

*Chapter 8, Introductions and sections 8-1 to 8-3, 8-8 to 8-11, and 8-14 to 20*

*Chapter 10, sections 10-4 to 10-11 & 10-16*

*Browse Chapter 5, sections 5-3, 5-5 & 5-12*

*Chapter 7, sections 7-2, 7-3, 7-5 & 7-9*

*Chapter 8, sections 8-4, 8-5 (note phase one trial), 8-6, 8-7 & 8-13*

*Chapter 12 sections 10 to 16*

*Chapter 13 section 6 (super-antigens)*

- Development and processing of T-cells.
- T-cell receptors
  - T-cell receptor diversity
  - Role of  $\alpha\beta$  receptors
  - role of  $\gamma\delta$  receptors
- MHC Presentation and T-cell Surface Proteins CD4 and CD8
  - Endogenous antigen processing
  - Exogenous antigen processing
  - Role of CD4 in recognition of MHC II
  - Role of CD8 in recognition of MHC I
  - 'T-cell restriction'
  - MHC polymorphism
- CD4 & CD8 T-cell subclasses
  - Cytotoxic T-cells, helper T-cells, regulatory T-cells
  - Clonal selection applies to cytotoxic T-cells
  - MHC I presentation & Tc-cell Activation
  - MHC II presentation & APC-cell Activation
    - Roles of antigen-presenting cells (APC's)
      - Macrophage
      - Dendritic cells
      - Langerhans cells
      - B-cells
- Adhesion molecules: CD molecules, selectins, integrins, toll-like receptors
- Role of CD4 Helper T<sub>H1</sub>-cells in CD8 cytotoxic T-cell activation
- Activity of cytotoxic CD8 T-cells
- Role of CD4 Helper T-cells in CD8 cytotoxic macrophage activation
- Role of CD4 Helper T<sub>H2</sub> -cells in CD4 B-cell activation
- T<sub>H1</sub> vs. T<sub>H2</sub> Responses
  - Humoral vs. cellular immune responses
  - Cytokine profiles
  - Polarization (humoral vs. cellular) of immune responses
  - Functions of cytokines in mediating polarization
- Activity of cytotoxic CD8 T-cells

## IMMUNODEFICIENCY

*Reading Chapter 13, sections 13-8 to 13-16 & 13-20 to 13-22*

*Selected Course Notes, 'Primary and Secondary Immunodeficiencies', pages 304 to 308*

*Read Selectively Chapter 13, sections 13-17 to 13-19, 13-21 & 13-23 to 13-25*

*Template Published by Educational Approvals Office (VP Ed Office)*

10/1/2019

- Primary immunodeficiencies
- Secondary immunodeficiencies including AIDS

## HYPERSENSITIVITY (Allergy)

*Reading Chapter 14, sections 14-1 to 14-6, 14-8 to 14-13*

*Selected Course Notes, 'The Hygiene Hypothesis', pages 294 to 295*

*Browse Chapter 14, section 14-7*

- The nature of hypersensitivity and allergens
- Types of hypersensitivity
  - Immediate-type hypersensitivity
    - Type 1 - Anaphylactic hypersensitivity
      - ◇ Systemic anaphylaxis
      - ◇ Localized anaphylaxis
    - Type 2 - Antibody-dependent cytotoxicity hypersensitivity
    - Type 3 - Complex-mediated hypersensitivity
      - ◇ Systemic
      - ◇ Localized
  - Delayed type hypersensitivity
    - Type 4 - Cell-mediated hypersensitivity
- Allergy rates and the hygiene hypothesis

## IMMUNOTOLERANCE

- Significance of immunotolerance to health
- Mechanisms of immunotolerance
  - Self-tolerance
    - Immunological silence
      - ◇ Central tolerance
      - ◇ Peripheral tolerance
      - ◇ Cross-tolerance
    - Immunological ignorance
  - Functional tolerance

## AUTOIMMUNITY

*Reading Chapter 16, sections 16-1 to 16-2, 16-15, 16-6, 16-8 to 16-10, 16-12 to 16-14 & 16-16 to 16-18*

*Selected Course Notes, 'Characteristics of Some Autoimmune Diseases', pages 296 to 303*

*Browse Chapter 16, sections 16-3, 16-4, 16-7 & 16-11*

- Major sources of autoimmunity
- Autoimmune diseases
  - Tissue-specific diseases
    - Aspermatogenesis
    - Sympathetic ophthalmia
    - Hashimoto's thyroiditis
    - Insulin-dependent diabetes
    - Autoimmune anemias
      - Pernicious anemia
      - Hemolytic anemias
    - Goodpasture's syndrome
    - Graves' disease
  - Systemic autoimmune diseases
    - SLE (Lupus)
    - MS
    - Rheumatoid arthritis

## TRANSPLANTATION IMMUNOLOGY

*Reading selectively Chapter 15, sections 15-1 to 15-14 & 15-18 & 15-23*

*Browse Chapter 15, sections 15-15 to 15-17 & 15-24 to 15-27*

- Autograft, isograft, allograft, xenograft
- Privileged sites & privileged tissues
- Graft rejection
  - Hyperactive rejection
  - Acute rejection

- First-set rejection
  - Second-set rejection
- Chronic rejection
- Prevention of rejection
  - Tissue typing
  - Immunosuppressive agents
- Clinical transplantation
  - Current status
  - Graft vs. host reaction
- Acquired immunotolerance
  - Low-zone tolerance
  - High-zone tolerance
  - Immunotolerance created by certain immunization regimes
  - Natural acquisition of 'immunotolerance' in people
- Blood Group Antigens
  - Rh antigens and fetal hemolytic disease
  - ABO antigens and compatible blood donors

## VACCINES

*Reading Chapter 11, sections 11-1 to 11-11 & 11-14 to 11-28.*

*Browse Chapter 11, sections 11-12 & 11-13*

- Needs, benefits, and potential risks
- Type of vaccines
  - Killed or otherwise inactivated vaccines
  - Live attenuated vaccines
  - Subunit vaccines
    - Purified biomolecules
    - Recombinant vaccines
    - Peptide vaccines
    - DNA vaccines
    - Heterologous vaccines

## CANCER IMMUNOLOGY

*Reading Chapter 17, sections 17-1 to 17-11 & 17-17*

*Browse Chapter 17, sections 17-12 to 17-16*

- Tumour-Specific transplantation antigens
  - Viral antigens
  - Chemically-induced tumour antigens
- Tumour-associated transplantation antigens
  - Carcinofoetal antigens
  - Embryonic antigens
  - Alpha-feto protein antigen
- Immune response to tumours
- Cancer immunotherapy
  - Cytokine therapy
  - Interferon therapy
  - Tumour necrosis factor therapy
  - Monoclonal antibody-based therapies
  - Anti-cancer vaccines

### **Additional laboratory-lecture topics in Immuno-Diagnostic Formats:**

- *Immunofiltration assays*
- *Immunochromatographic assays*
- *Immuno-electron microscopy*
- *Immuno-fluorescence microscopy*

### **Laboratory & Term Test Schedule**

*Please thoroughly read the introductory material and experimental protocol(s) in preparation for each experiment. Please make a flow chart for each experiment & complete the pre-lab questions.*

Wednesday, September 4<sup>th</sup>

*Lab-lecture on the general nature of antibodies and antigens.*

Pre-Lab Talk: Nature of Precipitin Reactions

**Gel Immunodiffusion and the Identification of Antigens by Precipitin Reactions**

**Experiment 1. The Ouchterlony Reaction**

**Experiment 2. The Radial Immunodiffusion (RID) Assay**

Wednesday, September 11<sup>th</sup>

**Experiment 1 (continued). Interpretation of Ouchterlony Reactions**

**Experiment 2 (continued). Interpretation of a Radial Immunodiffusion Assay**

Pre-Lab Talk: Nature of Agglutination Reactions

**Experiment 3. Identification of *Aeromonas salmonicida* by Latex Bead Agglutination Assay**

**Experiment 4. Detection of *Aeromonas salmonicida* Antigens, and Determination of Anti-*A. salmonicida***

**Polyclonal Antibody Titer Using an Indirect ELISA**

Coating the ELISA plates with antigen

*A continuance of relevant lecture material will be presented in this lab period.*

Wednesday, September 18<sup>th</sup>

Pre-Lab Talk: Principles of ELISA.

**Experiment 4. Detection of *Aeromonas salmonicida* Antigens, and Determination of Anti-*A. salmonicida***

**Polyclonal Antibody Titer Using an Indirect ELISA**

Conducting the ELISA

*Interpretation and discussion of ELISA results will occur in the following lecture period.*

Wednesday, September 25<sup>th</sup>

**Experiment 6. Propagation of CHO Cells in Tissue Culture**

*Lab lecture & demonstrations - Introduction to techniques for the propagation of tissue cultures and use of laminar flow hood and biosafety hoods for sterile tissue culture work. Logistical organization of the experimental work in the following period.*

Wednesday, October 2<sup>nd</sup>

**Experiment 6. Propagation of CHO Cells in Tissue Culture**

Subculturing tissue cultures

Wednesday, October 9<sup>th</sup>

**Experiment 6. Propagation of CHO Cells in Tissue Culture (continued).**

Examination of tissue cultures

**Experiment 7. ELISA Detection of Hsp70 Expression in CHO Cells Treated with Heat or Oxidative Stress**

Cell treatment, harvesting and lysis

Coating of ELISA plates

Wednesday, October 16<sup>th</sup> **Term Test 1 9:30 AM to 11:20 AM, Room F360**

Wednesday, October 23<sup>rd</sup>

**Experiment 7 (continued). ELISA Detection of Hsp70 Expression in CHO Cells Treated with Heat or Oxidative Stress**

Conducting the ELISA for Hsp70

Wednesday, October 30<sup>th</sup>

*Pre-Lab Talk: Western Blotting for the Detection of Specific Antigens.*

**Experiment 8. Western Blotting Analysis of Hsp70 Response in CHO cells**

SDS-polyacrylamide gel electrophoresis separation of CHO cell proteins

Thursday, October 31<sup>st</sup> (the following lecture period)

**Experiment 8. Western Blotting Analysis of Hsp70 Response in CHO cells (continued).**

Electrophoretic transfer of proteins onto nitrocellulose

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*Page 8 of 12*

10/1/2019



Wednesday, November 6<sup>th</sup>

**Experiment 8. Western Blotting Analysis of Hsp70 Response in CHO cells** (continued).  
Immuno-detection of Hsp70 on western blots

Wednesday, November 13<sup>th</sup>. **Term Test 2 2:30 PM to 4:20 PM, Room F360**

Wednesday, November 20<sup>th</sup>

**Experiment 10. Monoclonal Antibody Production and Characterization**

Propagation of Monoclonal Antibody Producing Hybridoma Cell Tissue Cultures  
(Prior Lecture Material: *Creating Hybridomas for Producing Monoclonal Antibodies (MAB's)*).

Wednesday, November 27<sup>th</sup>

**Experiment 10. Monoclonal Antibody Production and Characterization** (continued).

Immuno-chromatography Isotyping of the Monoclonal Antibodies (MAB's) in the Hybridoma Cell Tissue Culture Supernatants  
Lab Lecture - Comparison of Immunodiagnostic techniques for lab-based, field-based and OTC assays.

Wednesday, December 4<sup>th</sup>

*Final Exam review.*

**Final Exam:** The time and location of the final exam will be published by the College during the semester.

## 5. Basis of Student Assessment (Weighting)

(a) Tests

### Term Test #1

This test covers relevant material from approximately the first third of the course, including the laboratory component. The delineation of material students are responsible for will be provided in class about one week before the date of the test. This is a 110 min. test that will be written on Wednesday, October 16<sup>th</sup> from 9:30 AM to 11:20 AM in F360. The results of this test contribute to **25%** of the final grade.

### Term Test #2

This test covers relevant material from approximately the second third of the course, including the laboratory component. The delineation of material students are responsible for on this test will be provided in class about one week before the date of the exam. This is a 110 min. test that will be written on Wednesday, November 13<sup>th</sup> from 9:30 AM to 11:20 AM in F360. The results of this test contribute to **25%** of the final grade.

*If either of the term exams is missed due to illness or other justifiable reason, with accompanying documentation the percentage value of that term exam (25%) will be added to the percentage value of the final exam.*

(b) **Final Exam**

The final exam is a comprehensive exam that includes components from the laboratory section of the course. The value this exam contributes to the final grade is **40%**. The time and location of the final exam will be published by the College during the Fall Semester. *(Please note that the exam time and date will not be changed by the college to accommodate vacation plans.)*

**Attendance at the final exam is mandatory.** Appropriate documentation must accompany any explanation for absence if an incomplete grade (I grade) is warranted for medical or other justifiable reason.

(c) Other

### Laboratory Experiments

**Attendance in the lab periods is mandatory.** No laboratory experiment can be missed without an acceptable reason submitted in writing, such as a letter from a MD.

Laboratory participation and performance contributes **5%** to the final grade. Pre-lab assignments including flow charts also contribute 5% to the final grade.

**Please come to each lab period prepared for the experiment. Please complete each short pre-lab assignment.**

There are no laboratory reports due for the experiments but *students are responsible for understanding the principles, technical bases, and results of each experiment.* These aspects of the laboratory work will be subject to examination on the term tests and the final exam.

## 6. Grading System

Standard Grading System (GPA)

Competency Based Grading System

## 7. Recommended Materials to Assist Students to Succeed Throughout the Course

Please refer to the required textbook and required course packages described above.

## 8. College Supports, Services and Policies



### Immediate, Urgent, or Emergency Support

If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @

<http://camosun.ca/about/mental-health/emergency.html> or <http://camosun.ca/services/sexual-violence/get-support.html#urgent>

### College Services

Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at <http://camosun.ca/>

### College Policies

Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at <http://camosun.ca/about/policies/>. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

A. GRADING SYSTEMS <http://camosun.ca/about/policies/index.html>

**The following two grading systems are used at Camosun College:**

### 1. Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

## 2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

## B. Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at <http://camosun.ca/about/policies/index.html> for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	<i>Incomplete:</i> A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	<i>In progress:</i> A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	Compulsory Withdrawal: A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

## **Academic Honesty**

Please become familiar with the new School of Arts & Science guide on academic honesty: <http://camosun.ca/learn/school/arts-science/images/Arts%20and%20Science%20Academic%20Honesty%20Guidelines.pdf>

### ***Please Note:***

Students may **not** use recording devices in the classroom without the prior permission of the instructor or the Centre for Accessible Learning. The instructor's permission is not required when the use of a recording device is sanctioned by the College's Centre for Accessible Learning in order to accommodate a student's disability, *and* when the instructor has been provided with an instructor notification letter which specifies the use of a recording device. Such recordings made in the classroom are for the student's personal use only, and distribution of recorded material is prohibited. Recordings made during the course would include statements, questions and comments made by students in the class, and these are not to be disseminated or repeated in any manner based on the recordings. **Otherwise, please have cell phones turned off and put away while in lectures. Thank you.**

***Camosun College is a scent-free institution.***

***Please refrain from wearing scents. Thank you.***