CAMOSUN COLLEGE	**School of Arts & Science** **CHEMISTRY AND GEOSCIENCE DEPARTMENT** **CHEM 251** **Immunology** **Fall Semester, 2013**

COURSE OUTLINE

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

Ω *Please note: the College electronically stores this outline for five (5) years only.*
*It is **strongly recommended** you keep a copy of this outline with your academic records.*
You will need this outline for any future application/s for transfer credit/s to other colleges/universities.

1. Instructor Information

(a)	Instructor:	Jamie Doran, Ph.D.		
(b)	Office Hours:	Monday, 2:30 to 4:20 pm Wednesday, 2:30 pm to 3:20 pm Thursday, 2:30 pm to 3:20 pm Friday, 1:30 pm to 3:20 pm Everyone is welcome whenever my office door is open. Appointments may be made to meet at other times. Office hours will be extended prior to test dates.		
(c)	Location:	Room 350C, Fisher Building, Lansdowne Campus		
(d)	Phone:	250.370.3441	Alternative Phone:	
(e)	Email:	jdoran@camosun.ca		

2. Intended Learning Outcomes

(No changes are to be made to these Intended Learning Outcomes as approved by the Education Council of Camosun College.)

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 immunological experimentation.

3. Required Materials

(a) Course Text Book

The Immune System. 3rd ed. Parham, P. (London: Garland Science, 2009)
This book is available in the Lansdowne Campus Book Store. Also, a copy of the textbook is available on loan through the Lansdowne campus reserve library.
[Supplementary information from articles recently published in relevant journals, including Nature Immunology Reviews, will be provided as required, by request, or for general interest.]

(b) Other

Laboratory Manual, and Selected Course Notes and Lecture Slides. 2013 Edition
A required course pack containing the laboratory manual, selected course notes, and selected lecture slides from the textbook is available through the Lansdowne Campus Bookstore.

General Materials and Supplies

Safety glasses — Safety glasses are required when handling hazardous chemicals or biochemicals. Each student is required to provide her or his pair of safety glasses. Students lacking safety glasses when they are required will not be permitted to work 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. Students lacking lab coats will not be permitted to work in the laboratory.

Latex gloves — Latex or other 'non-allergenic' gloves *will be available in the lab* and are to be used when appropriate to protect the skin from potentially hazardous chemicals or, much more often, to protect labile biochemicals and immunochemicals from contamination or becoming degraded by enzymes from the skin.

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

4. Course Content and Schedule

Credits: 4 credits

In-class workload: 6 hours per week

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

Out-of-class workload: 6 hours per week

Number of weeks: 14 weeks

Pre-requisite: Chem 120 - College Chemistry 1

Course times and locations

Chem 251 Section 001

Lectures

Tuesday Monday, 9:30 to 10:20 PM
Fisher Building, Room F360

Wednesday, 9:30 to 10:20 PM
Fisher Building, Room F360

Thursday, 9:30 to 10:20 PM
Fisher Building, Room F360

Laboratory Experiments & Term Tests Times*

Tuesday, 2:30 AM to 5:20 PM
Fisher Building, Rooms F360

* *Please see the laboratory and term test schedule below.*

Lecture Outline

HISTORICAL PERSPECTIVE
This topic is briefly introduced in the introduction (pages1-2) to Chapter One of The Immune System, 3rd ed. *by P. Parham. More extensive reading relevant to the initial lectures is provided in the selected course notes in the course package under the heading "Historical Perspective on the Field of Immunology'.*

- 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)
  - Nuttal (1888) & Von Behring (1888-1890's): humoral immunity
  - Wright (1903): synergy of cellular and humoral immunity.
  - Paul Erlich (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*.)
  - A history of vaccine use proves the efficacy of stimulating immunity to prevent major human infectious diseases.
  - Introduction to protective immunity & vaccination

GENERAL ROLE FOR THE IMMUNE SYSTEM IN MAINTAINING BODY INTEGRITY
Refer to Chapter 1, sections 1-1, 1-2, 1-5, 1-6 & 1-8 to 1-13

- 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
Refer to:
Chapter 1, sections 1-3, 1-4 & 1-7;
Chapter 2, sections 2-1, 2-5, 2-10, 2-11, 2-13 to 2-16, 2-2, 2-3, 2-6 to 2-9, 2-18, 2-17, 2-20 to 22;
Chapter 9, sections 9-17 & 9-19;
"Innate Immunity"' on pages 193 to 200 in the selected course notes in the course package.

- General characteristics of nonspecific physical and chemical defenses
  - Physical barriers
    - Skin and mucous membranes
  - Defensive chemicals
    - pH, lysozyme, iron-binding compounds, O_2, 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
    - Interferons α□and □β
    - Chemokines
    - Toll-like receptors
    - C-reactive protein & other acute phase proteins
    - Adhesion molecules
    - Broad picture of cytokine-mediated immunoregulation
- 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
    - NK-cells: roles in innate immunity: killing mechanism

ADAPTIVE IMMUNITY & THE PRINCIPLE OF CLONAL SELECTION
(some information will be introduced earlier in the curriculum to support laboratory experiments)
Browse Chapter 3 for a general overview of material detailed in following chapters.

- Basic nature of antibodies & T-cell receptors
- 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 information will be introduced earlier in the curriculum to support laboratory experiments)
Refer to Chapter 4, sections 4-1 to 4-16.

- 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
Refer to:
Chapter 6, Introduction, sections 6-1 & summary (browse chapter for interest);
Chapter 9, sections 9-1 to 9-17 & 9-20 to 9-25;
Chapter 10, sections 10-5 to 10-9, 10-11 to 10-19.

- 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_H2-cells in antibody production
- Role of CD4 Helper T_H2 -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
Refer to:
Chapter 7, Introduction and sections 7-1, 7-8 & 7-13;
Chapter 5, Introduction and sections 5.1, 5-4, 5-5 to 5.17 (browse the rest of Chapter 5);
Chapter 8, Introduction and sections 8-1 to 8-6;
Chapter 10, sections 10-5 to 10-6, 10-19 to 10-23, & 10-28 to 10-29.

- 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_H1-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_H2 -cells in CD4 B-cell activation
- T_H1 vs. T_H2 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

EVASION OF THE IMMUNE SYSTEM BY PATHOGENS
Refer to:
Chapter 11, sections 11-1 to 11-25;
Chapter 10, sections 10-1 to 10-4.
Handout materials will present very recent developments.

- Influenzae virus
- Trypanosomes
- Herpes virus
- Other pathogens

IMMUNODEFICIENCY
Refer to Chapter 11, sections 11-8, 11-11 to 11-25.
Handout materials will present very recent developments.

- Primary immunodeficiencies
- Secondary immunodeficiencies including AIDS

HYPERSENSITIVITY (Allergy)
Refer to Chapter 12, sections 12-1 to 12-24.
Handout materials will present very recent developments.

- 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
Refer to Chapter 13, sections 13-1 to 13-12, 13-13 to 13-17, 13-20 to 13-26.
Also refer to the Selected Course Notes.
Handout materials will present very recent developments.

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

TRANSPLANTATION IMMUNOLOGY
Refer to Chapter 15, sections 15-1 to 15-7, 15-9, 15-11, 15-18, 15-24 & 15-25.
(Browse the remainder of Chapter 15).

- 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
Refer to Chapter 14, sections 14-1 to 14-10.
Handout materials will present very recent developments.

- 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
Refer to Chapter 16, sections 16-1 to 16-14.
Handout materials will present very recent developments.

- Tumour-Specific transplantation antigens
    - Viral antigens
    - Chemically-induced tumour antigens
- Tumour-associated transplantation antigens
    - Carcinofetal 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:
Radioimmunoassay (RIA)
Immunofiltration assays
Immunochromatographic assays
Affinity chromatography
Immuno-electron microscopy
Immuno-fluorescence microscopy
Fluorescence-activated cell sorter.

Laboratory & Test Schedule

Thoroughly read the introductory material and experimental protocol(s) in preparation for each experiment.

Tuesday, September 3rd.
Organization of the laboratory portion of the course; Perspective on the inter-relatedness of experiments; Overall lab orientation; Explanation of proper use of a variety equipment.
Lecture material will also be presented in this initial lab period.

Tuesday, September 10th.
Gel Immunodiffusion and the Identification of Antigens by Precipitin Reactions
Pre-Lab Talk: Nature of Precipitin Reactions
Experiment 1. The Ouchterlony Reaction
Experiment 2. The Radial Immunodiffusion Assay
Lecture and lab-lecture material also will be presented in this lab period.

Tuesday, September 17th.
Experiment 1 (continued). **Interpretation of the Ouchterlony Reactions**
Experiment 2 (continued). **Interpretation of the Radial Immunodiffusion Assay**
Post-Lab Discussion - Interpretation of Precipitin Reactions

Pre-Lab Talk - Nature of Agglutination Reactions
Experiment 3. Use of a Latex Bead Agglutination Assay to Identify *Aeromonas salmonicida*, a Bacterial Pathogen of Salmon and Trout.

Lecture and lab-lecture material will be presented in this lab period.

Tuesday, September 24th.
Pre-Lab Talk - Principles of ELISA.
Experiment 4. Detection of *A. salmonicida* Antigens and Determination of Anti-*A. salmonicida* Polyclonal Antibody Titre Using an Indirect Enzyme-Linked Immunosorbent Assay (ELISA)
Part I. Coating of microtiter plate wells with antigens

Lecture and lab-lecture material will be presented in this lab period.

Tuesday, October 1st.
Experiment 4. Detection of *A. salmonicida* Antigens and Determination of Anti-*A. salmonicida* Polyclonal Antibody Titre Using an Indirect Enzyme-Linked Immunosorbent Assay (ELISA)
Part II. Conducting the ELISA
Interpretation and discussion of ELISA results will occur in the following lecture.

Tuesday, October 8th.
Pre-Lab Talk: SDS-PAGE in Western Blotting for the Detection of Specific Antigens.
Experiment 5. Western Blotting Analysis of *Aeromonas salmonicida* Proteins
Part I. SDS-polyacrylamide gel electrophoresis separation of proteins
Wednesday, October 9th. (the following lecture period)

Experiment 5. Western Blotting Analysis of *A. salmonicida* Proteins
Part II. Electrophoretic transfer of proteins onto nitrocellulose

Tuesday, October 15th. **Term Test 1** *2*:30 PM to 4:20 PM, Room F360

Tuesday, October 22nd.
Pre-Lab Talk: Western Blotting for the Detection of Specific Antigens.
Experiment 5. Western Blotting Analysis of *Aeromonas salmonicida* Proteins
Part III. Immuno-detection of antigens on western blots

Experiment 6. Differentiation and Titre Determination of Atlantic Salmon and Rainbow Trout Sera Using Monoclonal Antibodies in an ELISA Assay
Part I. Dilution of antigens, and coating of microtiter plates

Tuesday, October 29th.
Experiment 5. Western Blotting Analysis of *A. salmonicida* Proteins
Post-Lab Discussion - Interpretation of western blotting results

Experiment 6. Differentiation and Titre Determination of Atlantic Salmon and Rainbow Trout Sera Using Monoclonal Antibodies in an ELISA Assay
Part II. ELISA
Interpretation and discussion of ELISA results will occur in the following lecture.

Tuesday, November 5th.
Pre-Lab Lecture: Creating Hybridomas for Producing Monoclonal Antibodies (MAbs)
Experiment 7. Monoclonal Antibody Production and Characterization
Part I. Lab lecture & demonstration - Introduction to techniques for the propagation of tissue cultures and use of laminar flow hood and biosafety hoods for sterile tissue culture work

Tuesday, November 12th.

Experiment 7. Monoclonal Antibody Production and Characterization

Part II. Propagation of Monoclonal Antibody Producing Hybridoma Tissue Cultures.

Students will be timetabled to attend the lab in a staggered fashion.

Tuesday, November 19th. **Term Test 2** *2*:30 PM to 4:20 PM, Room F360

Tuesday, November 26th.

Experiment 7. Monoclonal Antibody Production and Characterization

Part III. Immuno-chromatography Characterization of the MAb Classes and Subtypes in the Hybridoma Tissue Culture Supernatants

Lab Lecture - Comparison of immunological techniques used for lab-based, field-based and OTC immunological diagnostic assays.

Tuesday, December 3rd.

Final Exam Review Session 1**

Final Exam: The time and location of the Chem 255 Final Exam will be published by the College during the Fall Semester. Both sections write together.

** An additional final exam review will be scheduled just prior to the exam date.

5. Basis of Student Assessment (Weighting)

(a) Tests

Term Test #1

This exam covers relevant material from approximately the first third of the course. 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 minute test that will be written on Tuesday, October 15th from 2:30 PM to 4:20 PM in F360. Students may choose to use the remainder of the lab time period.
The results of this test contribute to **30%** of the final grade.

Term Test #2

This exam covers relevant material from approximately the second third of the course. 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 Tuesday, November 19th. from 2:30 PM to 4:20 PM in F360. Students may choose to use the remainder of the lab time period.
The results of this test contribute to **30%** of the final grade.

If either of the term exams is missed due to illness, or other justifiable reason, with accompanying documentation then the percentage value of that term exam (30%) 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 cannot be changed to accommodate vacation or other personal 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 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 proper letter from a Medical Doctor.

Please come to each lab period prepared for the experiment.

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)

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	Minimum level of achievement for which credit is granted; a course with a "D" grade cannot be used as a prerequisite.	1
0-49	F	Minimum level has not been achieved.	0

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 E-1.5 at **camosun.ca** for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: 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	*In progress*: A temporary grade assigned for courses that, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. *(For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)*
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.

7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

A reading guide to the course text is provided for each topic (above). Supplementary course notes and copies of lecture slides that primarily present figures or tables from the text are provided in the course pack that also includes the Chem 251 Immunology Laboratory Manual. These notes support lectures and laboratory experiments by the provision of material on subjects that are not addressed in the sufficient detail in the text, or are addressed in less detail or from a different perspective. The copies of many selected lecture slides that present figures, tables or other complex or somewhat information-intensive materials will facilitate efficient note taking, and promote in-class learning and discussion.

LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College calendar, at Student Services, or the College web site at camosun.ca.

STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**.
It is the student's responsibility to become familiar with the content of this policy.
The policy is available in each School Administration Office, at Student Services, and the College web site in the Policy Section.

Please Note: Students may not use recording devices in the classroom without the prior permission of the instructor or DRC. The instructor's permission is not required when the use of a recording device is sanctioned by the College's Disabilities Resource Centre for Students 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. Recordings made in the classroom are for the student's personal use only, and distribution of recorded material is prohibited.