CAMOSUN COLLEGE	***School of Arts & Science*** ***CHEMISTRY AND GEOSCIENCE DEPARTMENT*** **CHEM 251-01** **Immunology** **2006F**

COURSE OUTLINE

The Approved Course Description is available on the web @
http://www.camosun.bc.ca/calendar/chem.php#251

Ω*Please note: this outline will be electronically stored for five (5) years only.*
It is strongly recommended students keep this outline for your records.

1. Instructor Information

(a)	Instructor:	Jamie Doran, Ph.D.		
(b)	Office Hours:	Monday, 12:30 to 2:20 pm Thursday, 12:30 to 2:20 pm Friday, 11:30 am to 1:15 pm *Students are 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 350A, Fisher Building, Lansdowne Campus		
(d)	Phone:	370-3438 (voicemail available)	Alternative Phone:	
(e)	Email:	jdoran@camosun.bc.ca		
(f)	Website:	**http://www.camosun.bc.ca/schools/artsci/chemgeo/doran.php**		

2. Intended Learning Outcomes

(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)

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)	Texts	***The Immune System***. Second Edition (2005). Au. Peter Parham. Garland Science. London. This book is available in the Lansdowne Campus Bookstore. Also, a copy of the textbook is available in the reserve library. Supplementary information from articles recently published in relevant journals, including Nature Immunology Reviews, will be provided as required, and primarily for interest. ***Laboratory Manual & Selected Course Notes*** A required booklet of experimental procedures, selected course notes and selected lecture slides from the textbook is available through the Lansdowne Campus College Bookstore.

(b)	Other	***General Materials and Supplies*** Safety glasses — Safety glasses are required when handling potentially hazardous chemicals. Students are required to provide their own pairs of 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 any experiments involving potentially hazardous chemicals or other materials. Students are required to provide their own lab coats. Students lacking lab coats when required will not be permitted to work in the laboratory. Latex gloves — Latex or similar gloves will be available in the lab and are to be used when appropriate to protect hands from potentially hazardous chemicals or to protect valuable immunochemicals from becoming degraded by enzymes from the skin. Hypoallergenic gloves are available for people with allergies to some types of latex gloves. Calculator — Scientific calculators may be required occasionally in the lab, in class and during exams. Students must provide their own calculators.

4. Course Content and Schedule

(Can include: class hours, lab hours, out of class requirements and/or dates for quizzes, exams, lectures, labs, seminars, practicums, etc.)

Course Content and Schedule

Credits	4 credits
In-class workload	6 hours per week • There are three 50-minute lectures per week. • Laboratory periods are 2 hours and 50 minutes. •
Out-of-class workload	6 hours per week
Number of weeks	14 weeks
Pre-requisite	Chem 120 - College Chemistry 1

Course times and locations

Lecture times	Tuesday 9:30 to 10:20 AM Fisher Building, Room F360 Wednesday 9:30 to 10:20 AM Fisher Building, Room F316 Thursday 9:30 to 10:20 AM Fisher Building, Room F360
Laboratory Periods	Tuesday 3:30 to 6:20 PM (Hopefully, students may start at 2:30 if they desire.) Fisher Building, Rooms F360 and F358

Alternatively this 3 h time period is used to host two term exams and a final exam review. Please see the laboratory and midterm exam schedules below.

Lecture Outline

HISTORICAL PERSPECTIVE

This topic is briefly covered in the introduction to Chapter One. The lecture content is provided in the selected course notes in the course package that is inclusive of the lab manual.

- Early historical evidence of immunity in humans
  - Athens bubonic plague survivors (430 BC) do not reacquire the disease
  - Certain African tribes practice immunization against snake venoms
  - Mithradates IV (ancient Greece) uses immunization against poisons
- Variolation
  - Origins in China and India prior to 1500 AD.
  - Approach to prevent smallpox spreads to Persian region.
  - Practice of variolation transferred from Turkey to England (1720's), but never widely adopted in Europe.
- Development of successful small pox vaccination
  - Jenner's development of a cowpox vaccine
  - WHO determines to rid the world of small pox in 1970's
  - Fate of existing stocks of small pox virus?
- The development of the field of immunology
  - Meaning of the term 'immunity'
  - Recognition of the four basic tenants of adaptive immunity
  - Louis Pasteur creates the field of immunology with seminal experiments demonstrating vaccination and acquired immunity in animals and

humans. He develops attenuated bacteria or viruses as vaccines. [His germ theory of disease laid the groundwork for these studies.]
    - Pasteur and Koch compete to create vaccines as vaccination becomes widely accepted in Europe and abroad.
    - Elie Metchnikoff initiates the field of cellular immunology with studies of phagocytes; his efforts also initiate the study of comparative immunology
    - Nuttal & Von Behring contribute to the discovery of humoral immunity
    - Wright proves that <u>both</u> cellular and humoral immunity make up the human immune system
    - Ramon develops toxoids (attenuated chemicals) as vaccines
    - A history of vaccine use proves to prevent major human infectious diseases

GENERAL ROLE FOR THE IMMUNE SYSTEM IN MAINTAINING BODY INTEGRITY

Refer to Chapter 1 of the course text - The Immune System *by P. Parham.*

- Challenges to health: infectious organisms, cancer, toxins
- Implications for transplantation, allergy, autoimmunity, pregnancy
- Blood, serum, plasma, antiserum
- Innate immunity 'versus' adaptive immunity

THE INNATE IMMUNE RESPONSE

Refer to sections 1.1 to 1.5 of Chapter 1 and Chapter 8, sections 8.1 to 8.14.

- General characteristics of nonspecific physical and chemical defenses
    - Physical barriers
        - Skin and mucous membranes
    - Defensive chemicals
        - pH, lysozyme, iron-binding compounds, O_2
    - 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
- Overview of humoral factors involved in innate immunity
    - Complement
    - Chemokines
    - Cytokines
    - Acute phase proteins
    - Interferon
- 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
    - Recognition of microbes through toll-like receptors
    - Microbial strategies for the prevention of phagocytic killing
- Natural killer (NK) cells
    - NK-cells: roles in innate immunity: killing mechanism
- Interferons
    - Interferons: α, β and γ : Nature and roles in preventing infection.
    - Antiviral drugs based on interferons
- B-cells & T-cells that contribute to innate immunity

THE LYMPHATIC SYSTEM

Refer to Chapter 1, sections 1.6 - 1.7.

- The lymphatic system
    - Primary and secondary lymphatic tissues
    - Structure and function of the lymphatic system

ADAPTIVE IMMUNITY & THE PRINCIPLE OF CLONAL SELECTION

*Refer to Chapter 1, sections 1.8 - 1.13; *optional: sections 1.14 & 1.15.*

- 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
- The B-cell response vs. the T-cell response
- Primary immune responses vs. secondary immune responses
- *Overview of immunodeficiency, allergy, autoimmunity & transplantation.

ANTIBODIES - STRUCTURE & FUNCTION

Refer to Chapter 2, sections 2.1 to 2.15.

- 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
- Monoclonal Antibodies
    - Basis and procedure for monoclonal antibody production
    - Clinical applications
- Genetics of human antibody formation
    - Multi-gene organization of immunoglobulin genes
    - Variable region gene rearrangements
    - Generation of antibody diversity

- Antibody production by B-cells
- Affinity maturation
- Relationship of affinity maturation to class switching

DEVELOPMENT OF B-LYMPHOCYTES

Refer to Chapter 4, sections 4.1, 4.2 & 4.6 to 4.10.

- Processing of B-lymphocytes and T-lymphocytes
- Development of B-cells
- Antibody production by B-cells
  - Clonal selection theory of antibody synthesis
  - B-cell receptors and antigen binding
  - B-cell activation and maturation
    - Plasma cells
    - Memory B-cells

T-CELL RECOGNITION OF ANTIGEN

Refer to Chapter 3, sections 3.1 to 3.19.

- T-cell receptors
  - T-cell receptor diversity
  - Role of αβ receptors
  - role of γδ 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

DEVELOPMENT OF T-LYMPHOCYTES

Refer to Chapter 5, sections 5.1 to 5.11.

- 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 I presentation & Tc-cell Activation

T-CELL MEDIATED IMMUNITY

Refer to Chapter 6, sections 6.1 to 6.17, and Chapter 8, sections 8-17 to 8.27.

- 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
- Cytokines

    - General nature and characteristics
    - Autocrine and paracrine functions
    - Classic characteristics: pleotrophy, redundancy, synergy, antagonism
- 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

B-CELL MEDIATED IMMUNITY

Refer to Chapter 7, sections 7.1 to 7.14.

- B-cell Receptors & cell adhesion molecules
- Role of CD4 Helper T_H2-cells in antibody production
- Activity of cytotoxic CD8 T-cells
- 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
- Antibody effector functions
    - Roles as adaptor molecules
    - 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)

COMPLEMENT

Refer to Chapter 7, sections 7.15 to 7.26; Chapter 8, sections 8.3 to 8.4, and to the selected course notes.

    - 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.

EVASION OF THE IMMUNE SYSTEM BY PATHOGENS

Refer to Chapter 9, sections 9.1 to 9.11.

- Influenza virus
- Trypanosomes (e.g. sleeping sickness)
- Enteric pathogens (e.g. *Salmonella*; *E. coli*)
- Herpes virus
- Others

IMMUNODEFICIENCY

Refer to Chapter 9, sections 9.8 to 9.12.

- Primary immunodeficiencies
- Secondary immunodeficiencies
    - HIV & AIDS

HYPERSENSITIVITY (Allergy)

Refer to Chapter 10, sections 10.1 to 10.13.

- 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

AUTOIMMUNITY

Refer to Chapter 11, sections 11.1 to 11.22. Also refer to the Selected Course Notes.

- 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

VACCINES

Refer to Chapter 12, sections 12.1 to 12.8. Less detailed references to vaccines was made in previous sections of the text as well. 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
        - Heterologous vaccines

        - Peptide vaccines
        - DNA vaccines

TRANSPLANTATION IMMUNOLOGY

Refer to Chapter 12, sections 12.9 to 12.25.

- 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
- Immunosuppression
    - Immunological silence
        - Central tolerance
            - ◊ Thymic processing
            - ◊ Neonatal tolerance
        - Peripheral tolerance
    - 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

CANCER IMMUNOLOGY

Refer to Chapter 12, sections 12.26 to 12.39.

- 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

IMMUNOTECHNOLOGY (In Reference to Laboratory Experiments & Related Topics)

Refer to Selected Course Notes section of the Course Package

In vitro antibody-antigen reactions

Gel precipitin reactions

- Principles
- The Precipitin Curve
- The Lattice Theory

Applications of the Precipitin Reaction

- Ouchterlony double-diffusion method
  - Principle
  - Experimental design
  - Qualitative interpretation of results
    - ◊ Reaction of identity
    - ◊ Reaction of non-identity
    - ◊ Reaction of partial identity
- Radial immunodiffusion (RID)
  - Principle (Mancini single-diffusion method)
  - Experimental design
  - Quantitative interpretation of results

Agglutination reaction

- Principle & Experimental design
- Interpretation of positive or negative results

ELISA

- ELISA for Analysis of Antigen: Indirect & Direct Assays
- Capture ELISA for Analysis of Antigen
- Indirect ELISA for Analysis of Antigen

Western blotting detection of antigens

- Principle of Western Blotting Analysis of Antigen(s)
- General Procedure for Western Blotting
- Interpretation of results

Other Immuno-Diagnostic Formats:

Radioimmunoassay (RIA)
Immunofiltration assays
Immunochromatographic assays
Affinity chromatography
Immuno-electron microscopy
Immuno-fluorescence microscopy
Fluorescence-activated cell sorter.

Laboratory and Midterm Exam Schedules

Week 1 Tuesday, September 5th.

Organization of the Laboratory Portion of the Course; Perspective on Inter-Relatedness of Experiments; Overall Lab Orientation; Explanation of Proper Use of Various Micropipettors.

Week 2 Tuesday, September 12th.

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

Week 3 Tuesday, September 19th.

Experiment 1. (continued). Interpretation of the Ouchterlony Reaction
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.

Week 4 Tuesday,, September 26th.

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

Week 5 Tuesday, October 3rd.

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 ELISA.

Week 6 Tuesday, October 10th.

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

***A. salmonicida* Polyclonal Antibody Titre Using an Indirect Enzyme-Linked Immunosorbent Assay (ELISA).**
Post-Lab Discussion. Interpretation and Discussion of ELISA results.
Review for Term Test #1.

Week 7 **Tuesday, October 17th Term Test #1**

Week 8 Tuesday,, October 24th
Pre-Lab Talk: Western Blotting.
Experiment 5. Western Blotting Analysis of* Aeromonas salmonicida *Proteins.
Part I. SDS-polyacrylamide gel electrophoresis separation of proteins.

Week 9 Tuesday, October 31st.
Experiment 5. Western Blotting Analysis of* A. salmonicida *Proteins.
Brief Pre-Lab Talk: The Western Blotting Technique
Part II. Electrophoretic transfer of proteins onto nitrocellulose.

Week 10 Tuesday, November 7th.
Experiment 5. Western Blotting Analysis of A. salmonicida Proteins.
Part III. Immuno-detection of antigens on Western blots
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 I. Dilution of antigens, and coating of microtiter plates.

Week 11 Tuesday, November 14th.
Experiment 6. Differentiation and Titre Determination of Atlantic Salmon and Rainbow
Trout Sera Using Monoclonal Antibodies in an ELISA Assay
Part II. ELISA Assay.

Experiment 7. Monoclonal Antibody Production and Characterization
Part I. Propagation of Monoclonal Antibody Producing Hybridoma Tissue Culture.

Week 12 **Tuesday, November 21st. Term Test #2**

Week 13 Tuesday, November 28th
Experiment 6. Differentiation and Titre Determination of Atlantic Salmon and Rainbow
Trout Sera Using Monoclonal Antibodies in an ELISA Assay
Post-Lab Discussion. Interpretation and Discussion of ELISA results.

Experiment 7. Monoclonal Antibody Production and Characterization

Brief Pre-Lab Talk: Technique of Making Monoclonal Antibodies (MAbs)
Part II. Immunofiltration Affinity Chromatography Characterization of the Subtypes of the Monoclonal Antibodies in Hybridoma Tissue Culture Supernatants

Week 14 Tuesday, December 5th

Lab lecture: Other immuno-diagnostic technologies.
Comparisons of immunodiagnostic techniques.

Final exam review #1.

Final Exam: The time and location of the Chem 251 final exam will be published by the College during the Fall Semester.

5. Basis of Student Assessment (Weighting)

(Should be linked directly to learning outcomes.)

(a) 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 suitable note from Medical Doctor.
NB. There are no laboratory reports to be handed 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 midterm exams and the final exam.

(b) Midterm Exams

Term Exam #1

This exam covers relevant material from approximately the first third of the course. The delineation of material that students may be responsible for on this exam will be provided in class about one week before the date of the exam.
This is a 110 minute test written on Tuesday, October 17th in the adjoining rooms F360 & F358 during the 3:30 to 5:20 PM time period.
The value this exam contributes to the final grade is **30%.**

Midterm Exam #2

This exam covers relevant material from approximately the second third of the course. The delineation of material that you may be responsible for on this exam will be provided in class about one week before the date of the exam.

This is a 110 min. test written on Tuesday, November 21st in the adjoining rooms F360 & F358 during the 3:30 to 5:20 PM time period.

The value this exam contributes to the final grade is **30%**.

If either of the midterm exams is missed due to illness or for any other justifiable reason (accompanied by appropriate documentation), a student may either take a substitute test to be written at a mutually agreeable time, or choose to add the percentage value of that midterm exam (30%) to the percentage value of the final exam.

(c) Final Exam

The final exam is a comprehensive exam.
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.
Attendance at the final exam is mandatory. Appropriate documentation must accompany any explanation for absence.

6. Grading System

(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)

Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
95-100	A+		9
90-94	A		8
85-89	A-		7
80-84	B+		6
75-79	B		5
70-74	B-		4
65-69	C+		3
60-64	C		2
50-59	D		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 at **camosun.ca** or 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 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.

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.

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 are provided in the course manual which includes the laboratory experiment protocols. These notes, and copies of selected lecture slides, 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.

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 on the College web site in the Policy Section.