



School of Arts & Science
DEPARTMENT OF CHEMISTRY & GEOSCIENCE

Chemistry 214
NUTRITION FOR FITNESS

Winter Semester 2011

COURSE OUTLINE

Fundamental aspects of nutrition associated with improved fitness and health through exercise are presented. Topics include: balanced roles of proteins, carbohydrates, lipids, vitamins, minerals and water; supplements; dietary intake and energy usage; dietary programs and myths; nutrition for exercise and sports performance, cardiovascular health, diabetes, osteoporosis, hypokinetic disorders, obesity and aging.

The Approved Course Description is available at the Camosun College website @ <http://camosun.ca/learn/calendar/current/web/chem.html>.

Please note: This course outline will not be kept indefinitely. It's recommended students keep it for their records.

Instructor Information

- Instructor: Noa Deutsch, BSpC, IOC PGdip
- Office hours:
 - Monday, 11:30 pm to 1:30 pm
 - Wednesday, 10:30 am to 12:30 pm
 - Thursday, 10:30 am to 12:30 pm

Please note: Students are welcome whenever my office door is open. Appointments can be made for other times, and are encouraged. Office hours will be extended immediately before tests. Email and voice-mail messages are encouraged and always promptly responded to.

- Location: Campus Centre, room 118A. Interurban Campus
- Phone: 250-686-8827 (outside of office hours) / 250-370-4463 (during office hours)
- E-mail: deutschn@camosun.bc.ca

Intended Learning Outcomes (At the end of the course students will be able to):

1. Explain the fundamental roles and importance of dietary proteins, lipids (fats and oils), carbohydrates, vitamins, minerals and water, and the need for balanced intakes for optimal wellness.

2. Relate various recommended daily intakes of proteins, lipids, carbohydrates, vitamins, and minerals to appropriate dietary and, possibly, supplement sources with regard to exercise type and intensity, optimal recovery, and optimal wellness.
3. Describe the importance of appropriate hydration before, during, and after exercise, and explain the general importance of water consumption and electrolyte balance to optimal wellness.
4. Relate muscle function and energy expenditure to biochemical fuel sources required by the body during various types and durations of exercise.
5. Relate the basic functioning of the gastrointestinal tract, the liver and the kidneys to the uptake and subsequent utilization or elimination of nutrients or their metabolic products before, during and after exercise.
6. Outline the effectiveness or potential efficacy, and/or the potential concerns, of current nutritional supplements.
7. Describe important considerations when comparing various diets recommended for general wellness, or diets designed for people interested in achieving greater wellness through exercise targeting weight loss, or the general effects of aging.
8. Describe the rationale of diets designed for the management of diabetes, food intolerance, osteoporosis, poor cardiovascular health, or hypokinetic diseases as they relate to the preventive and/or rehabilitative effects of exercise.
9. Obtain refereed scientific and medical reports on-line or in print form for the purpose of accessing new information on diets and nutritional supplements related to exercise and wellness.

Required Materials

Text: McArdle, WD, Katch, FI & Katch, VL (2009). *Sports and Exercise Nutrition* (3rd Edition). Lippincott Williams & Wilkins: Baltimore, MD.

- Textbooks are available from the Interurban Campus Book Store. A copy will be made available in the reserve library at the Interurban Campus.

- Supplementary information from recently published, relevant peer reviewed articles in the area of nutrition for fitness and sports will be provided as part of the course, and upon request from interested students. Materials will be uploaded to D2L.

Laboratory Experiments: Experimental procedures are provided in the Chem 214: Nutrition for Fitness - Laboratory Manual & Course Study Guide available from the Interurban Campus Book Store. Please note: The laboratory experiments and the course study guides are currently undergoing major updating. Revised materials will be uploaded to D2L for cross-reference.

General Materials and Supplies

- **Calculator:** A non-programmable, non-cell phone-based, calculator will be required at times in the lab, in lecture, and during exams. Students are required to provide their own calculator.
- **Lab coats:** Required for any experiments involving hazardous chemicals, biochemicals or potentially biohazardous student samples (blood droplets, urine). Each student is required to provide her/his own lab coat. 'Disposable' or 'paper' lab coats are available from the Interurban Campus Book Store. Students will not be permitted to work in the laboratory without a lab coat when one is needed.
- **Latex gloves** (or 'non-allergenic' gloves): Will be available in the lab for several purposes including:
 - Handling any human sample, such as urine or blood.
 - To prevent contamination of sample materials with proteins, fats, oils and/or enzymes from the skin that may interfere with an experimental result.
 - If a person with an allergy, such as a skin contact-based food allergy, requires their use. People with food allergies should not risk inappropriate contact with allergens.

Course Content and Schedule

Credits: 3 credits

In-class workload:

- 3 x 50 minute lectures per week to students of sections X01 & X02 combined
- 1 x 1:50 hour lab period in approximately alternating weeks

Out of class workload:

- Approximately 4.5 hours per week. Please use this time thoroughly & wisely. If you require assistance, please do not hesitate to ask.

Number of weeks: 14 weeks

Pre-requisites (courses):

- BIO 141 - Anatomy for Sport Education
- BIO 142 - Physiology for Sport Education
- HLTH 110 - Health in Today's World
- SPEX 210 - Exercise Physiology

Lecture Outline

An outline of the topics to be covered in the course is provided below. Study guides for each chapter of the textbook are provided in the **Laboratory Manual and Course Study Guide**. Each study guide includes an assigned reading list for the chapter, a listing of the relevant discipline-specific vocabulary, a list of practice questions, and identification of relevant outside resources.

Supplementary materials, including scientific reports, review articles, and opinion papers will be provided throughout the course to enhance the curriculum and promote critical thinking, which is key in the field of exercise in wellness in general and fitness nutrition in particular.

Lecture Topics

1. Introduction to the Science of Nutrition

- History of sports & fitness nutrition science & practice
- Introduction to fitness & nutrition myths, fads, supplements, etc

2. Macronutrients (Chapter one)

A. Carbohydrates

- Biochemistry & general nature of carbohydrates
- Kinds and sources of carbohydrates
- Carbohydrate metabolism & its hormonal regulation
- Dietary intakes of various carbohydrates and its roles, benefits & concerns
- Diabetes & other diseases related to carbohydrate metabolism

B. Lipids

- Biochemistry & general nature of types of lipids (fats & oils)
- Lipid metabolism
- Dietary intakes of various lipids: Roles, benefits & concerns
 - Essential (omega-3 & -6), nonessential & trans-fatty acids
 - Cholesterol & cholesterol esters (intro: other sterols & steroids)
 - Lipid-soluble vitamins (A, E, D, K)
- Lipids and risks for cardiovascular & other diseases
- Protein and Amino Acids
 - Amino acid & Protein biochemistry and general nature

- Essential and non-essential amino acids
 - Dietary intakes of proteins and amino acids: Roles, benefits & concerns
 - Protein metabolism
 - Consideration for plant based diets
 - Protein metabolism and nitrogen balance
- 3. Micronutrients and Water** (Chapter two)
 - Nature of vitamins and minerals
 - Kinds of vitamins and minerals
 - Biochemistry, dietary sources & roles of vitamins
 - Biochemistry, dietary sources & roles of minerals
 - Relationship of nutrition to bone health
 - Three Major Essential Elements: Na⁺, K⁺ & Cl⁻
 - Water intake & water balance
- 4. Nutrient Digestion, Absorption and Elimination** (Chapter 3)
 - Biochemistry and chemistry of gastrointestinal function
 - Hydrolysis reactions and macronutrients
 - Enzymes
 - Membrane transport
 - Acid-base balance / pH buffering
 - Digestion & absorption
 - Overview and process of digestion
 - Gastrointestinal impairments & disease in relation to health & exercise
 - Probiotics & healthy gut flora
- 5. Bioenergetics - Nutrient Roles & Relationships** (Chapter 4)
 - Energy demands of muscle activity and metabolism
 - Energy systems
 - Oxidation & role of oxygen in energy metabolism
 - Energy release from carbohydrate, fat & protein
 - Regulation of energy metabolism
- 6. Macronutrient Metabolism Relationships to Exercise and Training** (Chapter 5)
 - Carbohydrate mobilization during exercise
 - Moderate, intense & prolonged exercise
 - Training effects on carbohydrate metabolism
 - Relationship of diet & stored glycogen to sports performance
 - Lipid mobilization during exercise

- Moderate, intense & prolonged exercise
 - Nutritional status effects on lipid metabolism
 - Training effects on lipid metabolism
 - Protein utilization & metabolism during exercise
 - Gender differences in substrate utilization
- 7. Measurement of Energy in food and during physical activity (Chapter 6)**
- Measurement of food energy
 - Macronutrient energy values
 - Net energy values of foods & energy value of a meal
 - Nutrient timing for optimal performance
 - Energy released by the body
 - Indirect vs direct calorimetry
 - The respiratory quotient & respiratory exchange ratio
 - Energy expenditure during rest & activity
 - Basal metabolic rate
 - Factors affecting energy expenditure
 - Energy expenditure during exercise
- 8. Nutritional Recommendations Physically Active Individuals (Chapter 7)**
- Energy balance
 - Principles of eating
 - Canadian, US & other dietary guidelines including dietary 'pyramids'
 - Popular dietary plans – pros and cons
 - Macronutrient needs: Carbohydrate, fat & protein
 - Vitamin & mineral needs for active individuals vs competitive athletes
 - Free radicals, antioxidants, infectious illness, cancer & immune response/function
 - Minerals and exercise performance
 - Exercise, food intake & high risk sports for energy balance
- 9. Nutrient Relationships to Intense Training & Sports Performance (Chapter 8)**
- Various sports products: bars, powders, gels & liquids
 - Training & Race day nutrition
 - Carbohydrate intake pre training and/or competition
 - Carbohydrate intake during training and/or competition
 - Refueling after exercise
 - Carbohydrates
 - Proteins

- Sport drinks for glycogen and electrolyte replacement
 - Lipid intake for endurance training and performance
 - 10. Nutritional Needs and Food Sources (Chapter 9)**
 - Food advertising and packaging
 - Government regulatory agencies
 - Food labeling & interpretation
 - Daily values
 - RDI
 - Nutrient density, nutrition & eating patterns (habits) & factors affecting food choices
 - 11. Exercise Thermoregulation and Fluid - Electrolyte Balance (Chapter 10)**
 - Mechanisms of thermal regulation
 - Thermal balance & regulation in extreme conditions
 - Thermoregulation during training in the heat
 - Fluid loss & dehydration
 - Fluid & electrolyte balance & replacement
 - 12. Ergogenic Supplements & Aids – Pharmacologic & Chemical (Chapter 11)**
 - Critical evaluation & thinking
 - Supplements commonly used: pros & cons, legal vs illegal, risk vs benefit
 - Endurance sports
 - Power/speed sports
 - Body building
 - General population
 - Weight loss
 - 13. Potential Nutritional Ergogenic Supplements (Chapter 12)**
 - Carbohydrate intake manipulation before, during & after training
 - Amino acid supplements
 - Potential supplementary augmentation of anabolic metabolism
 - L-Carnitine
 - Selective mineral supplements
 - Coenzyme Q supplementation
 - Creatine & ribose
 - 'Vitamin-like' biochemical supplements
 - Potential 'fat-burner' supplements
 - Glycerol
 - 14. Energy Balance, Exercise and Weight Control (Chapter 14)**
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1. Obesity: statistics, health risks, genetics & other factors
2. Physical activity & weight control
3. Weight loss
 - The competitive athlete
 - Energy balance equation
 - Extreme dieting & various diets
 - Role of exercise
4. Maximizing success: Strategies and considerations
5. Factors affecting muscle building & weight gain

Laboratory Experiments

Week 1: Lab Orientation, Safety & Organization, and Experiment Planning

- Safety outline
- Lab organization
 - Students 'pair-up' so that each pair has an individual willing to provide urine and/or participate in finger pin-prick blood droplet provision during certain labs
 - Dry-lab, dietary, self-assessment protocols are reviewed, and planning for sample and data collection, and sample storage will be conducted
- Outline the personal food journal analysis work that is conducted out of class at the beginning of the semester and analyzed in the lab periods: an individual food journal for 7 day food intake. Various software & tools will be examined prior to the recording of dietary diary. Each student's seven-day food journal will serve several purposes including:
 - Detailed examination of calorie intake, type and amount
 - Detailed examination of carbohydrate intake, type and amount
 - Detailed examination of lipid intake, type and amount
 - Detailed examination of protein intake, type and amount
 - Comparison to recommended values based on goals & activity level

Experiment Set I: Carbohydrates & Nutrition

Dry Lab #1: Carbohydrate Intake: Students will calculate their average weekly carbohydrate intake from their seven-day food journal. Calculations should be done in grams per kilogram of body weight, as well as percentage of body weight. Each person will compare his or her results to their calculated daily calorie requirements from carbohydrates, based on activity level (depending upon whether one desires to remain at the same weight or to be slowly and safely losing or gaining weight). A collection of class data will be assembled to give everyone a broader scope of carbohydrate intakes vs requirements. The data will be examined during the lab period.

Blood Glucose: The 'First Choice' in Energy: Students will drink a solution rich in glucose or will select to eat a particular carbohydrate rich food at the start of the lab. Drinks and or particular foods will be provided by each

student and should be approved prior to the lab. During the lab, pin-prick dip stick tests will be conducted on droplets of blood at selected intervals. A 'PA' hand-held analyzer will be used to provide results. The test will be repeated every 20 minutes. The data will be graphed to allow students to appreciate how rapidly insulin production rises to return blood glucose levels to normal. Students with diabetes, or pre-diabetic conditions, or glucose-intolerance will not participate directly but will work with a partner.

Dry lab #2: A Comparison of the Energy Content and the Carbohydrate & Sugar Contents of Various Sports Drinks and gels:

Students will be assigned either a particular sports drink or sports gel and will provide a breakdown of the carbohydrate amount, type & percentage of solution. These must be supplied a week prior to the lab period. Follow-up during the lab: A comparison of the results will be discussed in light of the potential demands of the body for rapidly absorbed sugar as a calorie-replacement during or following aerobic vs. anaerobic of exercise.

A Taste-Test of Natural and Artificial Sweeteners: In this lab period, students will also examine the taste perception of the sweetness of natural and artificial sweeteners at a constant concentration.

Experiment Set II: Lipids & Nutrition

'Good Cholesterol' - 'Bad Cholesterol': Simple, pin-prick, dipstick-based analyses of total blood cholesterol levels, and LDL & HDL levels, will be used. The data will be compared with optimal levels and ratios of cholesterol, LDL ('bad' cholesterol) and HDL ('good' cholesterol) in association with wellness, and considered in light of recent dietary intake (dry-lab data).

Dry Lab #3: Lipid Intake: Students will compare their daily average dietary lipid intake calculated from their seven day journal with each other and with recommended levels of both calorie intake and lipid intake. A collection of class data will be assembled to give everyone a broader scope of lipid intake vs. optimal intakes for as broad a spectrum of individuals as the class provides. The data will be considered in light of diet type and very recent food intake.

Experiment Set III: Proteins & Nutrition

Protein in Urine: Using the urine samples collected from individual students, an analysis will be conducted using test strips. This can be done in the student's home and results will be recorded and discussed during the lab period.

Dry Lab #4: Protein Intake: Students will calculate their average daily protein intake from their seven-day journal and compare it to recommended daily intakes based on exercise habits and/or goals.

Dry Lab #5: Are All Protein Supplements Made Equal? Student will be assigned a particular supplement and will provide an analysis of the supplement. These must be supplied a week prior to the lab period. Follow-up during the lab: A comparison of the results will be discussed.

Experiment Set IV: Hydration; Fluid & Electrolyte Balance

A Look at Water Balance: Students will engage in their normal exercise pattern and will weigh themselves before and after exercise to estimate water loss during exercise. Body weight changes will be recorded.

Urine will be analyzed in a similar way to the protein lab protocol. Discussion will follow during the lab period.

Dry-Lab #6: Students will calculate their average water and sodium (and other mineral) intake from their seven-day journal and compare it to standard daily requirements and dietary regime.

Experiment Set V: Nutrition & Bone Health

Dry-Lab #7: Students will complete consideration of their seven-day journals in the lab, by examination of Ca^{2+} and PO_4^{3-} intakes in comparison to recommended levels.

Basis of Student Assessment (Weighting)

(a) Project and Assignments (combined value 25% of final grade)

1. Seven-day, detailed food journal & analyses.....	10%
3. Critical analysis of a popular dietary plan.....	5%
4. Case study of a topic/specific population in nutrition.....	10%

The seven-day food journal must be completed during the first 21 days of the semester. Other assignments and dates for submission will be provided at appropriate times spread across the semester.

(b) Laboratory Experiment Reports

The lab reports total grade contributes a value of 20% to the final grade. 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 Medical Doctor.

(c) Midterm Exam

The midterm exam grade contributes a value of 20% to the final grade. This exam covers relevant material from approximately the first half of the course. The delineation of material that students will be responsible for will be provided about one week before the date of the exam. This is a 110 minute exam that will be written during a laboratory period in the lab room, TC230, or preferably in a classroom TBA.

(d) Final Exam

The final exam grade contributes a value of 30% to the final grade. The emphasis is on material not covered previously the midterm exam, and on material that integrates the information from various sections of the course.

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

The College will publish the time and location of this 3 h final exam during the semester as indicated in the College Calendar.

(e) Attendance & Participation

5% of the final grade is allocated to attendance and participation. Attendance in both classes and labs is mandatory. If students must miss a class or lab, please email or call in advance, providing a reason. Participation in class discussion is encouraged to enhance the learning process.

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		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	<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	<i>Compulsory Withdrawal:</i> 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.

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

After every section, sample exam questions will be posted on D2L. The corresponding text website provides learning resources that will further enhance the understanding and appreciation of the curriculum of this course. Additional resources will be provided throughout the course as needed.

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, Registrar's Office or the College web site at <http://www.camosun.bc.ca>

ACADEMIC CONDUCT POLICY

There is an Academic Conduct Policy. It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, Registration, and on the College web site in the Policy Section.

www.camosun.bc.ca/divisions/pres/policy/2-education/2-5.html