



**School of Arts & Science**  
**MATHEMATICS DEPARTMENT**  
**MATH 260-section**  
**Applied Multivariable Calculus**  
**Semester/Year, eg, 2006F or 2006Q1**

## COURSE OUTLINE

The Approved Course Description is available on the web @ \_\_\_\_\_

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:	Gilles Cazelais		
(b)	Office Hours:	Posted on my website		
(c)	Location:	CBA 158		
(d)	Phone:	370 - 4495	Alternative Phone:	
(e)	Email:	cazelais@camosun.bc.ca		
(f)	Website:	<a href="http://pacificcoast.net/~cazelais/">http://pacificcoast.net/~cazelais/</a>		

### 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 limits of functions of a single variable and justify limits that do not exist.
2. Use differentials in linear approximation and error analysis of functions of a single variable.
3. Find the derivatives of elementary functions of a single variable.
4. Evaluate integrals using methods of integration by parts, trigonometric substitutions and partial fractions.
5. Evaluate improper integrals.
6. Evaluate indeterminate forms using L'Hôpital's rule.
7. Apply the integral test, comparison tests, ratio test and root test.
8. Find the Maclaurin and Taylor series expansions of functions of a single variable.
9. Use dot product and cross product to solve different geometric problems in 2-space and 3-space.
10. Visualize a function of two variables using contours.
11. Evaluate limits of functions of two variables and justify limits that do not exist.
12. Use differentials in linear approximation and error analysis of functions of several variables.
13. Use the chain rules for functions of several variables.
14. Find partial derivatives implicitly.
15. Use directional derivatives to solve problems in optimization.
16. Find equations of tangent planes and normal lines to surfaces.
17. Find relative extrema of a function of several variables.

18. Use the second partials test to find relative extrema of a function of two variables.
19. Solve problems using the method of least squares.
20. Apply the Lagrange Multipliers method to solve constrained optimization problems.
21. Evaluate a double integral as an iterated integral.
22. Use a double integral to evaluate the area of a plane region and the volume of a solid region.
23. Evaluate double integrals in polar coordinates.
24. Find the mass, centre of mass and moments of inertia of a planar lamina using double integrals.
25. Use a double integral to find the area of a surface.
26. Use a triple integral to find the volume, the mass, the centre of mass and moments of inertia of a solid region.
27. Evaluate triple integrals in cylindrical or spherical coordinates.
28. Use a Jacobian to change variables in a double and/or a triple integral.

### 3. Required Materials

(a)	Texts	
(b)	Other	

SEE BELOW

### 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.)*

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### 5. Basis of Student Assessment (Weighting)

*(Should be linked directly to learning outcomes.)*

(a)	Assignments	
(b)	Quizzes	
(c)	Exams	
(d)	Other (eg, Attendance, Project, Group Work)	

SEE BELOW

### 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	<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.

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

### 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](http://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.

### ADDITIONAL COMMENTS AS APPROPRIATE OR AS REQUIRED

# MATH 260

## Applied Multivariable Calculus

**Instructor:** Gilles Cazalais

**Office:** CBA 158 (phone number: 370-4495)

**Office hours:** [http://pacificcoast.net/\\_cazelais/schedule.html](http://pacificcoast.net/_cazelais/schedule.html)

**Email address:** [cazelais@camosun.bc.ca](mailto:cazelais@camosun.bc.ca)

**Course web page:** [http://pacificcoast.net/\\_cazelais/260.html](http://pacificcoast.net/_cazelais/260.html)

### **Textbook**

Calculus (8th Edition) by Larson, Hostetler, Edwards.

## Homework

A list of suggested homework problems will be posted regularly on the course web page. These homework problems will not be turned in, but complete understanding of them will be essential for success in the course.

## Evaluation

- Three term tests: 40%
- Comprehensive final exam: 60%

## Course Outline

### 1. REVIEW

- Limits (1.1 - 1.5, 3.5)
- Differentiation (2.1 - 2.5)
- Integration (4.4, 4.5)
- Logarithmic, Exponential, and Other Transcendental Functions (5.1 - 5.8)
- Integration Techniques (8.1 - 8.5)
- Indeterminate Forms and L'Hôpital's Rule (8.7)
- Improper Integrals (8.8)

### 2. INFINITE SERIES

- Power Series (9.8)
- Representation of Functions by Power Series (9.9)
- Taylor and Maclaurin Series (9.10)

### 3. VECTORS AND GEOMETRY OF SPACE

- Vectors in the Plane (11.1)
- Space Coordinates and Vectors in Space (11.2)
- The Dot Product of Two Vectors (11.3)
- The Cross Product of Two Vectors in Space (11.4)
- Lines and Planes in Space (11.5)
- Surfaces in Space (11.6)
- Cylindrical and Spherical Coordinates (11.7)

### 4. VECTOR-VALUED FUNCTIONS

- Vector-Valued Functions (12.1)
- Differentiation and Integration of Vector-Valued Functions (12.2)
- Velocity and Acceleration (12.3)

### 5. FUNCTIONS OF SEVERAL VARIABLES

- Introduction to Functions of Several Variables (13.1)
- Limits and Continuity (13.2)
- Partial Derivatives (13.3)
- Differentials (13.4)
- Chain Rules for Functions of Several Variables (13.5)
- Directional Derivatives and Gradients (13.6)
- Tangent Planes and Normal Lines (13.7)
- Extrema of Functions of Two Variables (13.8)
- Application of Extrema of Functions of Two Variables (13.9)
- Lagrange Multipliers (13.10)

### 6. MULTIPLE INTEGRATION

- Iterated Integrals and Area in the Plane (14.1)
- Double Integrals and Volume (14.2)
- Change of Variables: Polar Coordinates (14.3)
- Center of Mass and Moments of Inertia (14.4)
- Surface Area (14.5)

- Triple Integrals and Applications (14.6)
- Triple Integrals in Cylindrical and Spherical Coordinates (14.7)
- Change of Variables: Jacobians (14.8)