**MTH 277-002A** (44518)          **Vector Calculus  (4 CR.)**          **Fall 2015**
# Syllabus

**Instructor**: Dr. Alexander Krantsberg
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**Office**: Bisdorf, Room AA 352

**Class Time**: Tuesdays and Thursdays 7:30 PM - 9:20 PM.
**Classroom**: Bisdorf / AA 467

**Office hours**: Tuesday and Thursday 5:00 PM – 7:00 PM

### Important Dates

| | |
|---|---|
| **August  24** | **Classes begin** |
| **September 7** | **Labor Day holiday. College closed.** |
| **September 10** | **Last day to drop a class with a tuition refund** |
| **October 12-13** | **Professional development days for faculty.  No classes.** |
| **November 3** | **Last day to withdraw without grade penalty.** |
| **November 25** | **Non-instructional day. No classes. College offices close at noon.** |
| **November 26-27** | **Thanksgiving holiday. College closed.** |
| **November 25** | **Non-instructional days. No classes. College offices closed.** |
| **December 14 – 19** | **Final exam week** |
| **December 17** | **Final Exam** |

## Course Content
 (visit http://www.nvcc.edu/academic/coursecont/summaries/mth277.htm for details)

### Course Description
Vector Calculus MTH 277 presents vector valued functions, partial derivatives, multiple integrals and topics from the calculus of vectors. Lecture 4 hours per week.
### Course Purpose
This course is primarily for students in mathematics, engineering the sciences and other areas requiring strong mathematical backgrounds. The purpose is to give students a basic understanding of the concepts of differential calculus and integral calculus of several variables.
### Prerequisites
Satisfactory completion of MTH 174 - Calculus with Analytic Geometry II or quivalent.

### Course Objectives
After completion this course, you should be able to:
   A. determine the equation of lines, planes, spheres, cylinders, and quadric surfaces in 3- dimensional space
   B. define a three-dimensional vector function and compute its higher order derivatives

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C. determine the arc length of a vector function and determine the tangent, normal, binormal, velocity and acceleration vectors and curvature for a vector function at a given point
D. define limit and continuity of a function of two or three variables
E. define and compute the partial derivative, total derivative, directional derivatives and extrema of functions of two and three variables
F. compute exact differentials and line integrals
G. compute double integrals in Cartesian and polar coordinates
H. compute triple integrals in Cartesian, cylindrical, and spherical coordinates
I. apply Green's Theorem to the solution of line integrals
J. compute area, volume, mass and center of mass using double and triple integrals
K. obtain competency in the use of a graphing utility and CAS in the topics below

## Major Topics

A. Three-Dimensional Geometry and Vector Functions
       1. Definition
       2. Vector algebra (dot and cross products, direction cosines)
       3. Equations of lines, spheres, cylinders and quadric surfaces
       4. Derivatives and definition of vector functions
       5. Arc Length
       6. Tangent, normal, binormal vectors; velocity and acceleration

B. Partial Derivatives
       1. Limit and continuity of functions of two and three variables
       2. Partial and total derivatives: directional derivatives
       3. Extrema of functions of two and three variables
       4. Exact differentials

C. Double and Triple Integration
       1. Definition
       2. Double and triple integrals in various coordinates (Cartesian, cylindrical and spherical)
       3. Line Integrals
       4. Green's Theorem
       5. Area, volume, mass and center of mass using double and triple integrals

**Textbook**

**Calculus: Early Transcendental Functions**, 6th Edition, by Ron Larson and Bruce Edwards;        ISBN:  978-1-285-77477-0
   This textbook is also used in Calculus II MTH 174 and Vector Calculus MTH 277 .

There are three options for you to choose.
1. Rent a used or new textbook ($135-$195).
2. Buy a used or new textbook ($225-$300).
3. Buy a textbook with WebAssign Access Code ($336).
4. Buy a WebAssign Access code with an online version of the textbook (eBook) –
(under $80 for one term and about $110 for the life of the edition).

**WebAssign**

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WebAssign is  a valuable tool for study and review, but it is not required. There will be an extra credit of 10% for homework  if you do it online using WebAssign.

If you purchased access to WebAssign, the class key is  **nvcc 1561 1244**

**Solutions to odd-numbered numbers problems in the textbook can be found on**
http://www.calcchat.com


 **Calculator**
This course requires a graphing device TI-83 or better; TI-89 is highly recomended.



# Grading Policy
**Grading Categories**
- Homework -   10%
- Quizzes -      15%
- Exams   -      45 %
- Final Exam -  30 %

**Course Grade**
The course grade will be a letter grade:

         A  - 90%-100%
         B - 80%-89.9%
         C - 70%-79.9%
         D - 60%-69.9%
         F  - below 60%


No audits are given in this class. **The last day to withdraw with refund is September 10, 2015**. **The last day to withdraw without grade penalty is** November 3, 2015. You are responsible for doing all paperwork before these dates.


**Attendance**:
It is very important to attend this class. If you miss no more than two classes, your lowest grade on homework, quizzes, or tests will be dropped. My experience shows that regular attendance and active class participation, in most cases, results in a passing grade.


# Grading Assignments
**Homework**: Problems will be assigned for every section covered in class. The homework is due the following week of class. Do not forget to put your name, the text book section, pages and problem numbers.
Note: *If your average grade on the tests is more than 70%, you will get a 5% extra credit for your homework.*
**Quizzes**: We will have quizzes on most weeks when there is no test. You can make up two quizzes.


**Tests**: There will be four tests, one hour each.
   The tentative schedule for the tests is this.

# Syllabus

**Test 1     September  8**
**Test 2     October 6**
**Test 3     November 3**
**Test 4     December 1**

Please let me know in advance if you are not able to attend the class on any of these days. You may make up a test within two weeks after the test. It is your responsibility to schedule the make-up test with me.

## Final Exam

The final exam is scheduled for **Thursday,  December  17, 2015 from 7:30 PM to 9:20 PM**.
The exam will be comprehensive and cover all course material.
All Students are expected to attend the final exam. There is no make-up for the final.

## Exam and Test Policy

You may not share calculators during exams or quizzes. You may not use cell phones as calculators during exams and quizzes.
Cheating – receiving or giving unauthorized help- will result in a score of 0 on that exam.

## Classroom Behavior

You should silence cellular phones. No texting during class time.

## Inclement Weather or Other Emergency Events

If the college is closed, a text alert will be sent to cell phones registered on NOVA Alert, a notice will be posted on the College's website www.nvcc.edu/emergency. You can also call the College Call Center at 703.323.3000.

## Special Needs and Accommodations

Please address with me any special problems or needs at the beginning of the semester. If you are seeking accommodations based on a disability, you must provide a disability data sheet, which can be obtained from the counselor for special needs, who is located in Bisdorf (AA) 229, phone (703) 933-1840. More information may be found at the following website:
http://www.nvcc.edu/current-students/disability-services/index.html

### Note: The syllabus is subject to change.

## Course Outline
**(Subject to change at any time)**

| Week | Date | Section | Assignment (due the following week on Monday) |
|------|------|---------|-----------------------------------------------|
| 1 | 08/25 | 11.1 Vectors in the Plane<br>11.2 Space Coordinates<br>11.3 The Dot Product | pp.755-758:1,7,12,25,28,31,38,40,41,49,68,75<br>pp.763-765:1,14,24,36,38,42,45,57,65,70<br>pp.773-774:8,16,18,21,26,32,63,69 |

| 1 | 08/27 | 11.4 The Cross Product | pp.781-782:2,6,8,16,22,28,30,31,34,37,49 |
|---|---|---|---|
| 2 | 09/01 | 11.5 Lines and Planes in Space<br>11.6 Surfaces in Space | pp.791-793:1,8,16,22,25,31,33,38,44,52,61,63,74,84,93<br><br>pp.802-803:1,2,4,6,13,15,19,21,23,31 |
| 2 | 09/03 | 11.7 Cylindrical and Spherical Coordinates | pp.809-811:1,8,10,16,20,25,32,38,44,51,60,62,66,87 |
| **3** | **09/08** | **TEST 1** | |
| 3 | 09/10 | 12.1 Vector-Valued Functions<br> 12.2 Differentiation and Integration of Vector-Valued Functions | pp.821-823:2,9,15,22,27,37,48,53,67,70<br><br>pp.830-832:14,22,25,30,39,42,44,52,60 |
| 4 | 09/15 | 12.3 Velocity and Acceleration<br>12.4 Tangent Vectors and Normal Vectors | pp.838-840:3,14,20,21,33,45,50<br><br>pp.848-850:2,8,14,22,41,49 |
| 4 | 09/17 | 12.5 Arc Length and Curvature | pp.860-862:3,12,20,26,33,37,42,53,81 |
| 5 | 09/22 | 13.1 Introduction to Functions of Several Variables | pp.876-879:3,12,20,26,33,37,42,53,81 |
| 5 | 09/24 | 13.2 Limits and Continuity | pp.887-889:6,16,26,31,43,57,64,76 |
| 6 | 09/29 | 13.3 Partial Derivatives<br>13.4 Differentials | pp.896-897:3,12,18,29,41,47,52,56,62,67,84<br>pp.905-906:2,8,14,17,26,33,37 |
| 6 | 10/01 | 13.5Chain Rules | pp.913-914:1,4,6,10,11,14,15,17,22,28,34,49 |
| **7** | **10/06** | **TEST 2** | |
| 7 | 10/08 | 13.6 Directional Derivatives and Gradients | pp.924-926:3,7,10,15,20,25,33,40,47,54,61 |
| 8 | 10/13 | | **Professional Development day for faculty. No classes.** |
| 8 | 10/15 | 13.7 Tangents Lines and Normal Lines | pp.933-935:6,12,19,25,29,32,40,45,51 |
| 9 | 10/20 | 13.8 Extrema of Functions of Two Variables<br>13.9 Applications of Extrema | pp.942-945:5,8,24,43,47,62<br><br>pp.949-951:1,6,10,17,31 |
| 9 | 10/22 | *13.10 Lagrange Multipliers | pp.958-959:3,6,9,14,27,39 |
| 10 | 10/27 | 14.1Iterated Integrals and Area in the Plane<br>14.2Double Integrals and Volume | pp.972-973:1,5,10,11,14,18,27,31,32,36,43,46,54,61,68<br><br>pp.983-985:1,2,7,10,13,16,21,24,25,31,35,46,51 |
| 10 | 10/29 | 14.3 Change of Variables | pp.991-993:1,6,8,9,14,19,22,25,28,31,36,43,39,59 |
| **11** | **11/03** | **TEST 3** | |
| 11 | 11/05 | 14.4Center of Mass and Moments of Inertia<br>*14.5 Surface Area | pp.1000-1001:1,5,8,11,14,21,23,28,35 |
| 12 | 11/10 | 14.6 Triple Integrals and Applications | pp.1017-1019:1,6,9,11,14,18,21,25,28,33,35,38,51 |
| 12 | 11/12 | 14.7Triple Integrals in | pp.1025-1027:2,6,8,10,13,21,24 |

| | | Cylindrical and Spherical Coordinates | |
|---|---|---|---|
| 13 | 11/17 | *14.8 Change of Variables | |
| 13 | 11/19 | 15.1Vector Fields | pp.1049-1052:1,7,25,38,39,60 |
| 14 | 11/24 | 15.2 Line Integrals | pp.1079-1081:1,9,14,16,19,22,25,27,35,51 |
| 14 | 11/26-27 | | **Thanksgiving holiday. College closed.** |
| **15** | **12//01** | **TEST 4** | |
| 15 | 12//3 | 15.3Conservative Vector Fields | *pp.1090-1092:6,8,14,20,26,37,50 |
| 16 | 12/08 | 15.4Green's Theorem | pp.1099-1101:2,8,12,16,22,26 |
| 16 | 12/10 | Review | |
| 17 | 12/15 | Review | |
| **17** | **12/17** | **Final Exam** | **7:30 PM – 9:20 PM** |