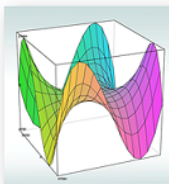
MIDDLESEX COUNTY COLLEGE



Welcome to

# Multivariable Calculus

## MAT 233 – 01, Fall 2017

Class meets Mondays and Wednesdays 9:00 – 10:50 a.m. in Main Hall 125

Hello! I look forward to working with you in Calculus III this semester. In this course, many of the seemingly isolated concepts that you studied in Calculus I and II will come together in a meaningful way. We'll extend and apply many of the principles you've already learned to study curves, surfaces, and vector fields in three dimensions. Upon successfully completing this course, you will have the knowledge and skills to understand, interpret, and solve multivariate and vector calculus problems and their real-world applications.

*Dr. Kathy Shay*

## Professor contact information:


**Dr. Kathy Shay**

kshay@middlesexcc.edu

Office location: Center II room 102

Office phone: 732-548-6000 x 3733

Voicemail: 732-807-5280


## Office Hours – please stop by and see me!

| Monday | Tuesday | Wednesday | Thursday |
|---|---|---|---|
| 2:30 – 3:30 | 11:00 – 1:00 | 11:00 – 12:00 | 1:00 –2:00 by appt. |

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## What's this course about?

The catalog description reads, "Emphasis is on the study of analytic geometry and calculus in three dimensions. Topics include solid analytic geometry, partial derivatives, multiple integrals, and topics in vector analysis such as Green's theorem, the divergence theorem, surface integrals and Stokes' theorem. Recommended for students majoring in engineering, mathematics, computer science, social sciences, and the science related fields of chemistry and physics."

## What will I get out of this course?

Learning Outcomes

Upon successful completion of Calculus III, you should be able to:

1. Visualize, analyze and describe curves, surfaces, and regions in two and three dimensions in various coordinate systems.
2. Apply properties of vector operations to analyze trajectories and geometric objects.
3. Solve multivariable calculus problems through the application and extension of concepts learned in Calculus I and II.
4. Apply theorems of vector calculus to calculate line and surface integrals.
5. Utilize the principles of analytic geometry and calculus to solve real-world problems.

In addition, this course will help to develop your mental acuity and analytical skills.

## How will I know I'm learning?

Throughout the course, you will have lots of opportunities to solve problems on your own, with others, and to share what you've learned through writing and presentations.

- **Background checks** will alert you to any prerequisite skills that you need to refresh in order to learn new material.
- **Clicker questions** and **team problem solving** in class will provide ample occasions to test your understanding of new concepts.
- **Homework assignments** in MyMathLab will give you immediate feedback as well as problem-specific support. Use the homework to reinforce learning and achieve mastery.
- **The semester-long project** will give you the opportunity to see how the complex concepts of Calculus III are built upon basic principles that you already know.
- **Quizzes** and **exams** are designed to assess the content knowledge and skills you develop during the semester. They're your opportunity to demonstrate what you've learned.

# What book and other resources do I need?

**Text:** Multivariable Calculus by Briggs, Cochran, Gillett © 2013, with **MyMathLab**

**MyMathLab:** MyMathLab includes an interactive electronic version of the text, a personal study plan, all homework assignments and lots of multimedia resources. You can link to MyMathLab via the MyLab and Mastering link in the course navigation menu in Canvas.

**Course ID:** shayXXXX

Options:

1. Use the MyMathLab account that you purchased with your Calculus I/II textbook to access all electronic materials for this course. Cost: $0.00.
2. Purchase the textbook with MyMathLab access from the college book store for $173.30.
3. Purchase MyMathLab, which includes an interactive e-book, separately without the text.

**Calculator:** A graphing calculator is required.

**Canvas:** I post a lot of useful material on Canvas. After each class, Canvas will be updated with a **To Do** list, a copy of class notes, attendance records, and more. The online gradebook will help you track your grade throughout the semester.

**Piazza:** Piazza is a FREE online Q&A platform that we will use to display solutions to problems and ask and answer questions. You can link to Piazza directly from the course navigation menu in Canvas. You can earn extra credit points by posting correct solutions to problems on Piazza (see page 8).

**Signup link:** piazza.com/middlesexcc/XXXX

You may also want to download the free mobile app for your smart phone or tablet.

# What are the technology requirements?

You will need a computer with Internet access to fully utilize the multimedia features MyMathLab. Pearson's Student Support page offers guidance on setting up your system. Once you've logged in to MyMathLab, be sure to run the **Browser Check** to find out if you have all the necessary plugins.

Though there is no mobile app for MyMathLab, you will have access to many, but not all, of its features on your mobile device.

**There are free mobile apps for both Canvas and Piazza**.

Please view my brief Tech Intro video for an introduction to these tools.

# Important Policy Information

**Attendance** Regular attendance is essential for success in this class. Please plan to attend and to be on time for every class session. Attendance will be taken. If you must miss a class, please notify me by phone or e-mail.

**Homework** Solving problems, working with others, and working on your own is a fundamental part of the learning process. Do all homework when it is assigned and get help when you need it. Homework counts both directly and indirectly towards your grade, as explained on page 7. Homework completed after, but within 5 days of the due date will receive partial credit.

**Missed Work** If you miss a class, please check our class page on Canvas to find out what work you missed and catch up in a timely fashion. The Canvas page will be updated with current notes, handouts, and assignments. You are welcome to visit me during office hours to discuss missed work. *As a general rule, I do NOT give make-ups, nor do I accept work turned in late*. If you miss a test or quiz or fail to complete an assessment on the due date, you will receive a score of ZERO unless you contact me within 24 hours of the absence and provide proof of a VERY SERIOUS REASON for your absence. Such cases will be handled on an individual basis.


**Classroom Courtesy** You are requested to arrive to class on time and to avoid behavior that might distract or irritate your classmates or me. Refer the college catalog or website for information about the Code of Student Conduct at Middlesex County College. Please keep phones and mobile devices silent during class. Engaging in social media and texting in class distracts not only you but those around you. Don't do it! Seriously!


**Academic Integrity** Honesty and integrity are highly valued in this class. Cheating will not be tolerated. You are not permitted to copy another's work and represent it as your own or to assist another student in committing an act of academic dishonesty. Any student found to be cheating on a test, quiz or assignment will receive a score of zero. A second offense will result in failure of the course and, as a repeated violation of the Code of Student Conduct, may also result in academic probation, suspension, or dismissal from the College.

**Registrar Withdrawal Information** Students sometimes have a need to withdraw from a class due to personal or academic reasons. The last day to withdraw with a grade of W is **Thursday, November 9**. If you do encounter difficulties, please contact me prior to withdrawing. I want to help you succeed.

# Available Help and Support

There are many support services that can help you as you work to achieve your goals. I encourage you to reach out to me or other professionals on campus. Here's a summary of the available resources:

| | |
|---|---|
| Me  | Email me at kshay@middlesexcc.edu or stop by my office in Center II room 102. Emails will be answered within 24 hours Monday-Friday. |
| Online resources | • In addition to homework and the e-book, mymathlab.com has a wealth of multimedia tools and a personal study plan to help you develop an understanding of calculus.<br>• Check Canvas frequently for updates on assignments, announcements, class notes and other handouts. You will also find links to helpful videos and web sites on our Canvas page. |
| Tutors | The Tutoring Center in Johnson Commons (IRC 241) offers free peer tutoring in many subjects, including calculus. Please check the posted schedule for the availability of Calculus III tutors. |
| Librarians | The library offers assistance with finding and evaluating information. Visit the library in person, or check their website for more information. |
| Personal, Transfer, and Disability Counselors | The Counseling department offers confidential individual counseling and presents several workshops throughout the semester. Visit Edison Hall room 100, call 732-906-2546, or check their website for more information. |
| Academic Advisors | The Academic Advising Center offers drop-in advising services. Visit West Hall, second floor, call 732-906-2596, or check their website. Full-time students are assigned an advisor. |
| NJ 211   | At MCC we are aware that many college students have difficulty affording groceries or accessing sufficient food to eat every day. We hope to get the necessary support to open a food pantry at the college to help alleviate food insecurity on our campus.<br><br>Please know that www.nj211.org provides assistance with hunger, housing, and other needs. They can be contacted through the web site or by dialing 211. |

*All students learn differently, and all learning styles are welcome in this class. If you have a physical, psychological, medical, or learning disability that may impact your course work, please let me know how I may assist you. Contact Disability Services as soon as possible to discuss the appropriate procedures for obtaining accommodations.*

*The Disability Services staff is located in Edison Hall, room 100. They can be reached at 732-906-2546. All information and documentation is confidential.*

# Useful Information

## Email

This semester, you'll have two MCC email accounts: @portal.middlesexcc.edu and @my.middlesexccc.edu.

The @portal address is on Campus Cruiser, which will be phased out at the end of this year. Campus Cruiser email has a rather small inbox that can reach capacity quickly when you send and receive files.

The @my.middlesexcc address is on Office 365, which includes our new Outlook email service, as well as 1 Terabyte (wow!) of cloud storage and access to online versions of Microsoft Word, Excel, and PowerPoint. There's a free mobile app for Outlook email!

If you haven't already signed up for Office 365, navigate to https://netid.middlesexcc.edu and claim your account now. More information and FAQs are posted on the IT page.

I recommend that you set your Campus Cruiser email to be forwarded to your Office 365 address. Here's how:

- Log into Campus Cruiser and go to the **PERSONAL TOOLS -> E-MAIL** menu.
- In the e-mail window select **FILTERS** from the Tools Menu on the left.
- Click on the **FORWARDING FILTER** tab.
- Enter your @my.middlesexcc.edu e-mail address, check to enable forwarding, and then click **SAVE**.

PLEASE CHECK YOUR E-MAIL AT LEAST ONCE A WEEK.

Are we having a snow day?
Check the college web site or call the
hotline for school closings at 732-906-2555.

## A Note About Learning

Though you've been a student for quite some time, it's possible that you've never been taught how to learn. Unfortunately, students often waste time and effort on ineffective study strategies. I recommend that you watch the video (8.5 minutes) from learningscientists.org on How to Study Effectively. There's a lot of research that supports successful outcomes from these six habits:

1. Spaced practice: Space out your studying over time, scheduling several short sessions a week.
2. Interleaving: Switch between ideas while you study.
3. Elaboration: Explain and describe ideas with many details.
4. Concrete examples: Use specific examples to understand abstract ideas.
5. Dual coding: Combine words/notation and visuals – a natural approach for studying math.
6. Retrieval practice: Test yourself often. Practice bringing information to mind.

Research shows that popular practices such as cramming, highlighting, and rereading notes are not particularly helpful. (Dunlosky, 2013)

# Assignments and Grading Information

Your grade will be based on the total number of points you earn from the following categories:

- **Homework on MyMathLab** Targeted practice is needed to help you learn new concepts, so there will be an assignment for you to complete on MyMathLab following each class. MML offers an unlimited number of attempts on each problem, and it provides hints and support to help you succeed. You'll have one week to complete each assignment for full credit. Partial credit is available for late work, with a deduction of 20% per day on problems done after the due date. It will be possible to earn up to 35 points for homework for <u>each half</u> of the semester, as follows:

| 7-week MyMathLab percentage | 90% and up | 80% but less than 90% | 70% but less than 80% | p% with p < 70 |
|---|---|---|---|---|
| Homework points earned | 35 | 32 | 28 | p% of 35 |

- **Background checks (BGCs)** Since prior knowledge is critical for learning, there will be 12 pass/fail online quizzes on prerequisite material. These background checks will be worth 5 points each. You'll get 5 points for a perfect score and 0 points for anything less than perfect. You'll be allowed an unlimited number of attempts, but background checks must be completed before the relevant class meeting. Short videos will be available to help you pass your background checks.

- **Quizzes** There will be eight 10-point quizzes; your best seven will count. Quizzes may be given in class or online. They will always be open book. Frequent quizzes will help you identify the concepts that you need to work on, give you practice in retrieving knowledge, and help to reduce test anxiety.

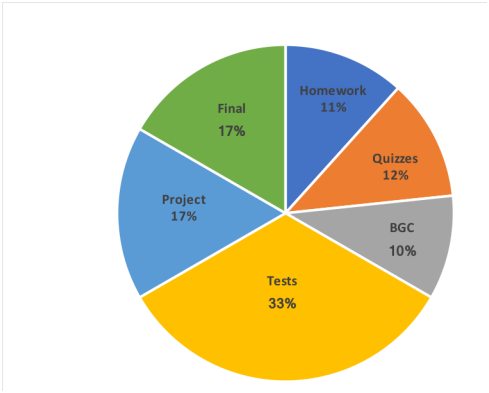
- **The Project** is a semester-long effort, divided into 2 parts, that will allow you to work with a group to trace the development of a calculus concept from Calculus I to Calculus III. Your group will create a web site on weebly.com or wix.com, or a PowerPoint or Prezi presentation. Details of the project will be provided in a separate handout. Working on this project will help you to recognize the bigger picture and understand how the concepts of calculus are interrelated. The group-work aspect will help you develop collaboration and communication skills, which are highly valued by employers. The project is worth 100 points.

- **Tests and the Final Exam** There will be two midterm tests and a cumulative final exam, each worth 100 points. You will be permitted to use a note sheet for each exam. Practice tests will be provided at least one week before each major test.

# Determining your grade

### Grade components

| | | |
|---|---|---|
| Homework | 70 | 11.7% |
| Background checks | 60 | 10.0% |
| Quizzes | 70 | 11.7% |
| Project | 100 | 16.7% |
| 2 tests @ 100 points each | 200 | 33.3% |
| The Final Exam | 100 | 16.7% |
| | 600 | ~100% |




## Grades will be assigned as follows:

| Points Earned | 540 to 600 | 522 to 539 | 480 to 521 | 462 to 479 | 420 to 461 | 360 to 419 | Below 360 |
|---|---|---|---|---|---|---|---|
| Percent | 90 to 100 | 87 BLT 90 | 80 BLT 87 | 77 BLT 80 | 70 BLT 77 | 60 BLT 70 | Less than 60 |
| Grade | A | B+ | B | C+ | C | D | F |

**Extra credit** points, or "brownie points", will be awarded for posting solutions to HW problems or answering questions on Piazza, and/or doing special (optional) problems. Use of the LaTeX equation editor in Piazza can get you **two** brownie points for each correctly answered question or solution; handwritten solutions are worth **one** brownie point if correct.


Also, when everyone in class answers a difficult clicker question correctly, or if I make 3 or more *mathematical* errors in a class, everyone in attendance gets a brownie point! You may earn a maximum of 30 brownie points for the semester.

**Please note:** Your grade is based upon your scores. I am not amenable to pleas for extra points at the end of the course. Before you consider emailing me about this, please read the advice of Mark Tomforde, a math professor at the University of Houston.

My best advice to you is: Do your homework! Quiz yourself frequently. Get help if you are stuck.

# Tentative Schedule of Topics and Assignments

Subject to change, due to unexpected happenings

Note: Chapter numbers are listed for the e-book and MyMathLab.
Chapter **n** in the e-book corresponds to chapter **n-1** in the printed text.

| Date | What's due? | Topics and events |
|---|---|---|
| Wednesday Sept. 6 | Read the syllabus! | Welcome and introductions.<br>Discuss project.<br>Review of trigonometry. |
| Monday Sept. 11 | **BGC** #1 | Polar coordinates (Ch. 12.2)<br>Vectors in $R^2$ (Ch. 13.1) |
| Wednesday Sept. 13 | **Quiz** on the syllabus | Vectors in $R^3$. Dot products (Ch. 13.2 – 13.3) |
| Monday Sept. 18 | **BGC** #2<br>HW on 12.2, 13.1 | Cross products. (Ch. 13.4) |
| Wednesday Sept. 20 | **BGC** #3<br>HW on 13.2, 13.3<br>**Quiz** on vector ops | Lines and curves in $R^3$. Calculus of vector-valued functions (Ch. 13.5 - 13.6) |
| Monday Sept. 25 | **Project components posted on Canvas**<br>HW on 13.4 | Motion in space (Ch. 13.7) |
| Wednesday Sept. 27 | **BGC** #4<br>HW on 13.5, 13.6 | Length of curves. Curvature and normal vectors (Ch. 13.8 – 13.9) |
| Monday Oct. 2 | HW on 13.7<br>**Quiz** on VVF | catch up and review |
| Wednesday Oct. 4 | HW on 13.8, 13.9 | **Test #1** |
| Monday Oct. 9 | Columbus Day – holiday | |
| Wednesday Oct. 11 | **Project part 1 due**<br>**BGC** #5 | Planes and surfaces. Conic sections (Ch. 14.1 and 12.4) |
| Monday Oct. 16 | **BGC** #6 | Graphs and level curves. Limits and continuity (Ch. 14.2 – 14.3) |
| Wednesday Oct. 18 | **BGC** #7<br>HW on 14.1, 12.4<br>**Quiz** on surfaces | Partial derivatives (Ch. 14.4) |
| Monday Oct. 23 | HW on 14.2, 14.3 | Chain rules, directional derivatives (Ch. 14.5, begin 14.6) |
| Wednesday Oct. 25 | HW on 14.4<br>**Quiz** on partials | Gradient, directional derivatives (Ch. 14.6) |
| Monday Oct. 30 | **BGC** #8<br>HW on 14.5 | Tangent plane and linear approximations. Max/min problems (Ch. 14.7 – 14.8) |
| Wednesday Nov. 1 | **BGC** #9<br>HW on 14.6<br>**Quiz** on $\partial, \nabla$ | Lagrange multipliers. Double integrals over rectangular regions (Ch. 14.9 – 15.1) |
| Monday Nov. 6 | **BGC** #10<br>HW on 14.7, 14.8 | Double integrals over general regions (Ch. 15.2) |

| Date | What's due? | Topics and events |
|---|---|---|
| Wednesday<br>Nov. 8 | **BGC** #11<br>HW on 14.9, 15.1 | Double integrals in polar coordinates. Triple integrals<br>(Ch. 15.3 – 15.4) |
| Monday<br>Nov. 13 | HW on 15.2<br>**Quiz** on dbl integrals | Triple integrals in cylindrical and spherical coordinates (Ch. 15.5) |
| Wednesday<br>Nov. 15 | HW on 15.3, 15.4 | Catch up and review |
| Monday<br>Nov. 20 | HW on 15.5 | **Test #2** |
| Wednesday<br>Nov. 22 | **BGC** #12 | Vector fields. Line integrals (Ch. 16.1 – 16.2) |
| Monday<br>Nov. 27 | **Project components posted on Canvas** | Conservative vector fields. Green's Theorem (Ch. 16.3 – 16.4) |
| Wednesday<br>Nov. 29 | HW on 16.1, 16.2<br>**Quiz** on line integrals | Divergence and curl. Surface integrals (Ch. 16.5 – 16.6) |
| Monday<br>Dec. 4 | HW on 16.3, 16.4 | Stokes' Theorem. Divergence Theorem (Ch. 16.7 16.8) |
| Wednesday<br>Dec. 6 | **Project part 2 due**<br>HW on 16.5, 16.6 | Project presentations |
| Monday<br>Dec. 11 | HW on 16.7, 16.8 | Catch up and review |
| Wednesday<br>Dec. 13 | **Cumulative Final Exam** | |