Prerequisite: MAT 266 or MAT 271 (Calculus II) or its equivalent with a grade C or better.
Classroom: T/Th DH 203, and via Zoom. Canvas calendar has the current link; Wed WXLR 309 via Zoom.

Disclaimer: All items on this syllabus are subject to change. The instructor reserves the right to modify it (including the dates of the tests) to meet the needs of the class. Any in-class announcement, verbal or written, is considered official addendum to this syllabus. It is the student responsibility to ‘attend’ class regularly and to make note of any change.

Tentative Lecture and Test Schedule

<table>
<thead>
<tr>
<th>Week Of</th>
<th>Section</th>
<th>Concepts/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/20 – 8/21</td>
<td>12.1</td>
<td>Introduction; 3-D Coordinate Systems</td>
</tr>
<tr>
<td>8/24 – 8/28</td>
<td>12.2-12.4</td>
<td>Vectors; Dot Product; Cross Product</td>
</tr>
<tr>
<td>8/31 – 9/4</td>
<td>12.5-12.6, 13.1</td>
<td>Lines and Planes; Cylinders and Quadratic Functions; Vector Functions and Space Curves</td>
</tr>
<tr>
<td>9/8 – 9/11</td>
<td>13.2-13.4</td>
<td>Derivatives and Integrals of V.F.’s; Arc Length &amp; Curvature; Motion in Space</td>
</tr>
<tr>
<td>9/14 – 9/18</td>
<td>14.1-14.2</td>
<td>Functions of Several Variables; Limits and Continuity; Test 1 Thursday 9/17</td>
</tr>
<tr>
<td>9/21 – 9/25</td>
<td>14.3-14.5</td>
<td>Partial Derivatives; Tangent Planes and Linear Approximations; The Chain Rule</td>
</tr>
<tr>
<td>9/28 – 10/2</td>
<td>14.6-14.7</td>
<td>Directional Derivatives and the Gradient; Maximum &amp; Minimum values</td>
</tr>
<tr>
<td>10/5 – 10/9</td>
<td>14.8, 15.1-2</td>
<td>Lagrange Multipliers; Double Integrals over Rectangles- General Regions</td>
</tr>
<tr>
<td>10/12–10/16</td>
<td>15.3</td>
<td>Double Integrals in Polar Coordinates; Test 2 Thursday 10/15</td>
</tr>
<tr>
<td>10/19–10/23</td>
<td>15.4-15.6</td>
<td>Applications; Surface Area; Triple Integrals</td>
</tr>
<tr>
<td>10/26–10/30</td>
<td>15.7-9</td>
<td>Triple Integrals in Cylindrical/Spherical Coordinates; Change of Variables</td>
</tr>
<tr>
<td>11/2 – 11/6</td>
<td>16.1-16.2</td>
<td>Vector Fields; Line Integrals</td>
</tr>
<tr>
<td>11/9 – 11/13</td>
<td>16.3</td>
<td>The Fundamental Theorem for Line Integrals; Test 3 Thursday 11/12</td>
</tr>
<tr>
<td>11/16–11/20</td>
<td>16.4-16.6</td>
<td>Green’s Theorem; Curl &amp; Divergence; Parametric Surfaces and Their Area</td>
</tr>
<tr>
<td>11/30–12/4</td>
<td>16.8-16.9</td>
<td>Stokes’ Theorem; The Divergence Theorem</td>
</tr>
<tr>
<td>12/7–12/11</td>
<td>Final Exam: Tuesday, December 8th from 7:10-9:00pm (online)</td>
<td></td>
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</tbody>
</table>

Video Resources
Videos for the content may be viewed at vidman.asu.edu website and https://math.la.asu.edu/~surgent/video.
ASU Synch/Immersion

Immersion modality: This class will follow the Immersion model of delivery. Classes will be held in person in our scheduled room and at the scheduled time, with a simultaneous remote delivery via Zoom. Your instructor will specify how the in-person arrangements will occur. You have the option to attend all classes remotely but please inform your instructor (from your ASU email account) in a timely manner to make sure he/she is aware.

The first class on August 20th will be held via zoom.

To access live sessions of this class go to myASU and click the Attend via Sync button next to this class on your schedule. Zoom Etiquette: During the live Zoom sessions, please log in on time and make sure that you have a reasonably secure connection. Please use your full name or first name-last initial. No outside attendees will be allowed, and during the sessions, please keep your microphone's audio muted except when needing to talk to the instructor. The instructor reserves the right to remove anyone from the Zoom sessions for disruptive behavior.


Requiring face coverings at ASU locations

This event/class/meeting will require face coverings. If you require accommodations due to a disability, please contact the Disability Resource Center (students) or the Office of Diversity, Equity and Inclusion (faculty/staff).

For sessions held in person, masks and other PPE must be worn in accordance with ASU’s policies. Failure to do so will result in your being asked to comply, then asked to leave if unable or unwilling to comply. Deliberate refusal to comply will be treated as a Student Code of Conduct violation and referred to the Dean’s office for review.

Note: A face shield can be used in addition to a mask, but not in place of a mask.

Course Access

Your ASU courses can be accessed by both my.asu.edu and myasucourses.asu.edu; bookmark both in the event that one site is down.

Technology Requirements

ASU Sync classes can be live streamed anywhere with the proper technology. We encourage you to use a PC or Apple laptop or desktop equipped with a built-in or standalone webcam. You will need an internet connection that can effectively stream live broadcasts. It is recommended that your internet download speed is at least 5.0 mbps. You can use this tool to test your current connection. We do not recommend the use of iPads or Chromebooks for ASU Sync as these devices do not work for class exams that may be proctored remotely.

If you are not able to personally finance the equipment you need to attend class via ASU Sync, ASU has a laptop and WiFi hotspot checkout program available through ASU Library.

Who is eligible?

- Any currently enrolled ASU student is eligible to checkout a laptop. Current availability of laptops: here.
- Laptops are lent on a first-come, first-serve basis, and cannot be reserved in advance. They can be returned at any time, but will be due at the conclusion of the fall 2020 semester.
- Rentals are limited to one laptop per student.
- Laptops are available for checkout at the following libraries on all four campuses. (Please check online for current library hours)
- Return laptops to any ASU Library Information Desk (not at the drop box or other location)
- Refer to ASU Library Computer Use Policy and ASU Computer, Internet, and Electronic Communications Policy.
- Borrowers are responsible for loss, damage, and theft of the laptop while in their possession. Borrowers should verify the condition of the laptop at the time of check-out and upon check-in.

Additional Requirements: This course requires the following technologies:

- Web browsers (Chrome, Mozilla Firefox, or Safari)
- Adobe Acrobat Reader (free)
- Adobe Flash Player (free)
- Webcam, microphone, headset/earbuds, and speaker
- Microsoft Office (Microsoft 365 is free for all currently-enrolled ASU students)
- MATLAB (available through MyApps for all currently-enrolled ASU students)
- Reliable broadband internet connection (DSL or cable) to stream videos.
- A graphing calculator (e.g. TI-84) is recommended. Calculators that perform symbolic manipulation (e.g. TI-89, TI-92, TI-Inspire CAS, Casio FX2 or 9970G) are not allowed for tests and quizzes.

**Student Success** To be successful:

- check the course daily
- read announcements
- read and respond to course email messages as needed
- complete assignments by the due dates specified
- communicate regularly with your instructor and peers
- create a study and/or assignment schedule to stay on track
- access ASU Student Resources

**Communicating with the Instructor**

**Campuswire:** We will be using the discussion board “Campuswire” for questions about the course. The system is highly catered to getting you help fast and efficiently from classmates and the instructor. Prior to posting a question, please check the syllabus, announcements and existing posts. If you do not find an answer, post your question. You are encouraged to respond to questions of your classmates. It is recommended you enroll in Campuswire even if you do not have any questions, as you might benefit from the posts of your classmates and instructor. Email questions of a personal nature to your instructor (rich@asu.edu)

**Email**

ASU email is an official means of communication among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly.

*All instructor correspondence will be sent to your ASU email account.*

**Exam Proctoring**

- This course uses online proctoring to ensure academic integrity. Online proctoring tools use the student’s device hardware (webcam & microphone) to record the student while they test in order to simulate in-person testing conditions. The tools may also record the student’s computer screen activity and physical room environment. Once testing is complete and the proctoring tool is closed, it will no longer have access to the device or its hardware and will be unable to monitor anything on the device or within the room.
- Before you start the test, you will be asked to perform a room scan to show your work environment and make sure there are no materials that are not allowed. Books, notes or “cheat sheets” of any kind are not allowed. If the room scan does not show your entire work environment, you will be in violation of the exam instructions and in violation of ASU’s Academic Integrity Policy. The penalties will range from deducting exam points, assigning a grade of zero to being reported for violation of the academic integrity policy.

**Copyrighted Materials**

Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement. The content of this course, including lectures and other instructional materials, are copyrighted materials. Students may not share outside the class, including uploading, selling or distributing course content or notes taken during the conduct of the course. Any recording of class sessions is authorized only for the use of students enrolled in this course during their enrollment in this course. Records and excerpts of recordings may not be distributed to others. Any (parts of) exams, assignment, reports, or solutions to these, from current or previous semester, posted to any website not affiliated with ASU will result in academic integrity disciplinary actions against the students posting them and the students using them.
Catalog Description: Vector-valued functions of several variables, partial derivatives, multiple integration.

Course Overview: We will discuss vectors and analytical geometry in three dimensions; vector-valued functions and curvature; components of acceleration; functions of several variables; limits and continuity in three-space; partial and directional derivatives; gradients, tangent planes, and extrema of functions of two variables; multiple integrals in rectangular, polar, spherical, and cylindrical coordinates; line integrals; applications of multiple integrals to area, volume, moments, centroids, and surface area.

Learning Outcomes: At the completion of this course, students will be able to, among other things:

- Describe the structure of a 3-D coordinate system.
- Perform vector operations including dot product and cross product.
- Find parametric equations of a line and scalar equation of a plane.
- Identify cylinders and quadric surfaces.
- Find domain, limit, derivative and integral of a vector function, and the tangent line to a space curve.
- Evaluate the arc length of a vector function.
- Solve applied problems involving velocity and acceleration
- Determine the domain and range of two and three variable functions, and interpret contour plots and level surfaces.
- Identify where a two variable function may be discontinuous.
- Find partial derivatives and explain their geometrical meaning.
- Find the tangent plane to a surface at a given point.
- Find linear approximations and differentials
- Write out and apply the chain rule.
- Evaluate gradients and directional derivatives
- Determine maximum and minimum values of a two variable function.
- Determine maximum and minimum values of a two variable function with constraints using Lagrange Multipliers.
- Evaluate double integrals over general regions.
- Convert double integrals from cartesian to polar coordinates and vice versa
- Evaluate triple integrals in Cartesian, cylindrical and spherical coordinates.
- Sketch vector fields
- Evaluate line integrals of scalar functions and line integrals of vector fields.
- Find a potential function for a conservative vector field.
- State and apply the Fundamental theorem for Line Integrals
- State and apply Green's Theorem
- Find curl and divergence of a vector field.
- Find an equation of the tangent plane to a parametric surface at a given point.
- Evaluate the surface area of a parametric surface on a given domain.
- Evaluate surface integrals of scalar functions and surface integrals of vector fields.
- State and apply Stokes’ Theorem
- State and apply the Divergence Theorem
Important Dates and Points Allocations

<table>
<thead>
<tr>
<th>Testing Schedule</th>
<th>Grade Allocations</th>
<th>Min. % for Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covering through</td>
<td>Tests</td>
<td>48%</td>
</tr>
<tr>
<td>Date</td>
<td>Recitation</td>
<td>A</td>
</tr>
<tr>
<td>1</td>
<td>12.1-12.6, 13.1-13.4</td>
<td>2/06</td>
</tr>
<tr>
<td>3</td>
<td>15.3-15.9, 16.1-16.3</td>
<td>4/10</td>
</tr>
<tr>
<td>Final</td>
<td>Comprehensive, including 16.4-16.9</td>
<td>4/30</td>
</tr>
<tr>
<td></td>
<td>Final Exam</td>
<td>E</td>
</tr>
</tbody>
</table>

Your final grade will be assigned based on the course credit you have earned during the period from the first day of class to the final exam, with weights assigned to grade components as given in the table above. Your opportunity to earn course credit ends with the final exam. You will not receive extra credit assignments before or after the final exam to raise your grade to a more desirable one.

Important date:

| Course Withdrawal Deadline | Nov 4, 2020 |

The used version of the textbook is fine. The new version of the textbook at the bookstore comes bundled with WebAssign at no added cost.
You must read each section of the textbook before it is covered in class.

Class Content, Teacher Expectations, Studying for the Class and Examinations

Attendance is expected. Your instructor may take regular attendance and incorporate attendance into your grade.

Quizzes: Quizzes will be given almost every class and will frequently reflect material that has recently been addressed.

Homework will be submitted online through WeBWorK. (Click on your instructor’s name at https://webwork.asu.edu.) Students are also responsible for reading each section before it is taught in class. For best results on the tests (especially the final exam), do not use the work of others (including Wolfram Alpha) to answer the problems.

Recitations Recitations help students to improve conceptual understanding in a collaborative work environment. You will be graded on participation, homework and quizzes. Honors work may be assigned as well. The Honors work will dip into differential geometry and seeing/using Calc III in your daily life. Recitations will be done via Zoom.

Graphing Calculator: A graphing calculator is required for this course. If you already have a graphing calculator, you may use it. Examples of highly recommended models are the TI-nspire & TI 83/84 or Casio 9850GB Plus. Calculators that do symbolic algebra, such as the Casio FX2, Casio 9970Gs,TI-89, TI-92, or TI-nspire CAS cannot be used in class or during an exam.

Reviews: Reviews and old exams are posted on the school’s website at https://math.asu.edu/mat272
It would also be a good idea to study a diverse sample of homework problems given in the textbook for additional review.
**Tutoring:** The following sites provide free tutoring to all ASU students:
- The Math Tutoring Center
- Engineering Tutoring Center
- The Math Community Center
- University Academic Success Program
- Students can also visit [https://tutoring.asu.edu](https://tutoring.asu.edu) and utilize Tutor Search to select their course and the times they are available to find a specific tutor that can assist them.

**Cell Phones and Electronic Devices:** Any student who accesses for any reason a phone or any internet-capable device during an exam will automatically receive a score of zero on the exam. All such devices must be turned off and put away and made inaccessible during the exam.

**Course Policies:**
- Students are responsible for assigned material whether or not it is covered in class. Working regularly on assigned problems and attending class are essential in order to do well. Expect to spend at least 6-10 hours weekly on homework/labs. You are expected to read the text, preferably before the material is covered in class.
- Make-up exams are at the discretion of the instructor and only in case of documented emergency. In any case, no make-up exams will be given unless the student has notified the instructor through email before the test is given.
- Cellular phones must be turned off during class. No texting, no ipods/ipads/laptops, etc.
- Quizzes are given in class unannounced. No late HW will be accepted and no make-up quizzes will be given.
- Arriving late to class will not be tolerated.
- All E-mail communication must be done from your ASU account. Due to FERPA (Family Educational Rights and Privacy Act), E-mails received from other accounts will not be answered.
- The course content, including lecture notes, is copyrighted material and students may not sell notes taken during the conduct of the course (see ACD 304-06, “Commercial Note Taking Services”.)

**Classroom behavior:** Classroom disturbances, including but not limited to: arriving late, talking in class and using cellular devices are not tolerated. The use of recording devices is prohibited. Each student is expected to show respect for every student registered in the course. An instructor may withdraw a student from a course when the student's behavior disrupts the educational process under SSM 201-10. Threatening behavior will be handled according to the Student Service Manual, SSM 104-02.
Students are required to adhere to the ABOR Student Code of Conduct, Academic Affairs Manual ACD 125 Computer, Internet and Electronic Communications, and the ASU Student Academic Integrity Policy.

**Studying for the class:** While diligent, timely completion of the online homework assignments is necessary to master procedural skills, this alone is usually not sufficient to gain conceptual understanding. To master the concepts, you must: review and study your class notes and/or the textbook thoroughly with the goal to understand the connections between the concepts; and create your own lists of definitions and theorems and commit them to memory like you would do with vocabulary in any language. You must do all this continuously throughout the semester. You must have learned the definitions and theorems covered in each class session and started the corresponding section of the online homework by the time of the next class session. Failure to know the material covered in lectures will result in your inability to follow subsequent lectures, and the difference between where you are in your understanding and where you should be will be compounded with each lecture. Relying on “just in time” cramming for exams is an ineffective study technique and will virtually guarantee failure in the class.

**SoMSS and University Policies and Procedures**
For semester deadlines related to enrollment, withdrawal or payments, see the academic calendar available at [https://students.asu.edu/academic-calendar](https://students.asu.edu/academic-calendar)

**The Y grade** is equivalent to a C or higher, but does not count in grade-point calculations. You are advised to speak with an advisor in your major's college to understand how the Y grade may affect your student standing,
requirements for your major, your scholarships, and so forth. Requests for the Y grade should be made to your instructor no later than November 4. In general, requests for the Y made after November 4 will not be considered.

Course Withdrawal: A student may withdraw from a course with a grade of W during the withdrawal period. The instructor's signature is required. It is a student's responsibility to verify that they have in fact withdrawn from a class.

Failing grades (The E, EN and EU grades)
--- The E grade is for students who participated in the class but did not earn enough credit to pass or attain the D grade.
--- The EN grade is for students who never once participated in the class. At the instructor's discretion, any student who has not attended class during the first week of classes may be administratively dropped from the course. However, students should be aware that non-attendance would NOT automatically result in being dropped from the course. Thus, a student should not assume they are no longer registered for a course simply because they did not attend class during the first week. It is the student's responsibility to be aware of their registration status.
--- The EU grade is for students who participated, but then stopped after a certain point and never resumed.

Final Exam Make Up Policies: The final exam schedule will be strictly followed. Except to resolve those situations described below, no changes may be made in this schedule without prior approval of the Dean of the college in which the course is offered. Under this schedule, if a conflict occurs, or a student has more than three exams on one day, the instructors may be consulted about an individual schedule adjustment. If necessary, the matter may be pursued further with the appropriate dean(s). This procedure applies to conflicts among any combination of Downtown Phoenix campus, Tempe campus, Polytechnic campus, West campus, and/or off campus class. Make-up exams will NOT be given for reasons of a non-refundable airline tickets, vacation plans, work schedules, weddings, family reunions, and other such activities. Students should consult the final exam schedule before making end-of-semester travel plans. Exceptions to the schedule and requests for make-up examinations can be granted only by the Department Chair, Associate Department Chair or the Director of First Year Mathematics, and for one of the following reasons:

1. Religious conflict (e.g., the student celebrates the Sabbath on Saturday)
2. The student has more than three exams scheduled on the same day as the math final
3. There is a time conflict between the math final and another final exam.

Incomplete: A grade of incomplete will be awarded only in the event that a documented emergency or illness prevents the student who is doing acceptable work from completing a small percentage of the course requirements. The guidelines in the current Student Service Manual regarding a grade of incomplete will be strictly followed. The form for an incomplete request is at https://students.asu.edu/forms/incomplete-grade-request. Once the student completes their part, they should bring it to the instructor for approval.

Absences related to religious observance/practices or university sanctioned events and activities: if you will be absent from class due to a religious observance or practice that are in accordance with ACD 304-04, or from participation in a university sanctioned event/activity in accord with ACD 304-02, it is your responsibility to inform the instructor during the first week of class. Your instructor will work with you on alternative and reasonable arrangements for any time missed.

Academic Integrity: Academic honesty is expected of all students in all assignments, examinations, papers, laboratory work, academic transactions and records. Academic dishonesty, including inappropriate collaboration, will not be tolerated. There are severe sanctions for cheating, plagiarism, and any other form of dishonesty. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see http://provost.asu.edu/academicintegrity and https://provost.asu.edu/sites/default/files/AcademicIntegrityPolicyPDF.pdf

Ethics: Grades are based only on academic work and are calculated using the same criteria for all students. It is highly unethical to bring to your instructor's attention the possible impact of your mathematics grade on your future plans, including graduation, scholarships, jobs, etc. The instructor may exercise an option to withdraw you from the course if they think you are compromising the ability to assess your work independently of any other consideration.
Title IX: Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish discuss any concerns confidentially and privately.

Disability Accommodations: Qualified students with disabilities who will require disability accommodations in this class are encouraged to make their requests to me at the beginning of the semester either during office hours or by appointment. Please schedule an appointment to see if you have a disability that will require accommodations in this class. Note: Prior to receiving disability accommodations, verification of eligibility from the Disability Resource Center (DRC) is required. Disability information is confidential.

Establishing Eligibility for Disability Accommodations: Students who feel they will need disability accommodations in this class but have not registered with the Disability Resource Center (DRC) should contact DRC immediately. Their office is located on the first floor of the Matthews Center Building. DRC staff can also be reached at: 480-965-1234 (V), 480-965-9000 (TTY). For additional information, visit: http://www.asu.edu/studentaffairs/ed/drc. Their hours are 8:00 AM to 5:00 PM, Monday through Friday. Please complete this process as soon as possible and schedule an appointment to see me during office hours if you have a disability that will require accommodations in the Disability Resource Center.