Calculus 3 MATH 2415  
Department of Mathematics and Statistics  
Spring 2018

A. COURSE INFORMATION

Course number/section: MATH 2415-001  
Class meeting time: MWF 1:00-1:50pm  
Class location: OCNR 258  
Course Website: bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Jordan Alexander  
Office location: CI 213a  
Office hours: MWF 9:00-10:00am, TR 11:00am-12:00pm  
Telephone: (361) 825-3613  
e-mail: jordan.alexander@tamucc.edu  
Appointments: email me to make an appointment to meet outside office hours

C. COURSE DESCRIPTION

Catalog Course Description
4 sem. hrs. (3:2)  
Parametric equations, vectors, functions of two and three variables. Contains a laboratory component.

Extended Course Description
Dot products, cross products, surfaces, tangent planes, partial derivatives, double and triple integration, change of variables, center of mass and first and second moments of 3D objects with variable density, vector fields, line integrals, Green’s Theorem, surface integrals, Stokes’ Theorem

Serves as a prerequisite for Fluid Mechanics, Electromagnetism, Thermodynamics, Quantum Physics, Nuclear Physics, Introduction to Analysis, Partial Differential Equations, and Introduction to Mathematical Statistics. Also aids the study of Physical Chemistry.

D. PREREQUISITES FOR THE COURSE

Prerequisites
MATH 2414

Corequisites
None
E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook(s)

Optional Textbook(s) or Other References
MIT OpenCourseWare @ http://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/index.htm

Supplies
Paper and pen or pencil, exploration notebook

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1. Use and convert among Cartesian, parametric, polar, and cylindrical coordinate systems.
   (a) graph a parametric curve
   (b) convert between rectangular and polar coordinates
2. Calculate dot and cross products as needed for vectors and vector valued functions and gradients.
   (a) calculate and use dot products and cross products of vectors
   (b) give the equation of a plane in 3 dimensional space
3. Calculate and apply derivatives and integrals for vector-valued functions.
   (a) calculate derivatives and integrals of vector-valued functions
   (b) calculate arc length for vector-valued functions
4. Calculate and apply derivatives and integrals for functions of several variables.
   (a) match 3d plots and contour plots of functions in 2 variables
   (b) calculate and use partial derivatives
   (c) calculate tangent planes to the graph of a function in two variables
   (d) use the chain rule for functions in several variables
   (e) take directional derivatives and determine gradient vectors
(f) determine minimum and maximum values of functions in several variables with or without constraints
(g) evaluate double and triple integrals over general regions
(h) change the order of integration in multiple integrals

5. Represent integrals in various forms using transformations (substitutions) and Green’s, Stokes’ and the Divergence Theorems.
   (a) use the change of variable formula for multiple integrals
   (b) evaluate line integrals
   (c) state and use Green’s theorem

G. INSTRUCTIONAL METHODS AND ACTIVITIES

Most class meetings will begin with the proposal of a significant problem in mathematics. Students will work individually and through group discussion to solve the problem. If the class is able to solve the problem, we will discuss the possible ways in which we can communicate our solution. We will not dedicate much time to working through specific examples, as the student will be asked to work out specific examples for homework.

If you must miss a class, you should watch the MIT OpenCourseWare preparation videos listed on the course schedule. The titles listed on our schedule each represent a cluster of short videos. A link will be provided on Blackboard, but students can use any search engine to find the cluster of videos online.

H. MAJOR COURSE REQUIREMENTS AND GRADING

Student learning outcomes will be measured in the following 4 ways:

1. We will have relatively short homework assignments online via WebAssign (which will be accessed through Blackboard). Clicking the WebAssign button on the top left of our Blackboard page should take you directly into WebAssign. You will either need the access code that comes with the book or will need to buy an access code online. There is an initial grace period, usually a week or two, during which you can use the system without an access code. These homework assignments should be completed while the day’s lesson is still fresh on the student’s mind, if possible, and will be due before class starts the following week.

Two homework grades will be dropped. These drops are meant to cover all possible good excuses for late work, such as short term illness, technical problems, and family emergencies. Long term illness and official university business are probably the only exceptions to this rule.

At any point before the last day of class, students may request old homeworks to be re-opened for partial credit. You will be able to earn 50% credit for any problems you have not answered correctly yet, and you will not be required to re-answer problems you have already answered correctly. You can request this type of homework extension through WebAssign or email.
2. Students will turn in one exploration assignment. For the assignment, choose a topic from Calculus 3 and explore it. You can either search for an application of calculus that sounds interesting to you or explore a topic from our textbook. Your grade on the assignment will be based on
(a) how well you articulate your own questions and thought process,
(b) how well your exploration addresses your questions,
(c) how much intuition you develop through example calculations, and
(d) whether or not you convince me you spent 4-6 hours on the assignment.

Please write legibly or type. I don’t care whether or not you answer your questions completely. I just want to see you genuinely explore some math.

3. Lab assignments will further develop students’ understanding of various topics discussed in class. All grading questions regarding labs should first be directed toward the lab instructor. Each student’s two lowest lab scores will be dropped.

4. Three in-class written exams will be given during the semester (with a fourth comprehensive final exam at the end of the semester). Students will not be allowed to use calculators, phones, notes, or any other type of help during the exams.

5. A comprehensive final exam will be given at the end of the semester and will be similar in style to the three semester exams. Studying for the final exam helps solidify students’ understanding of key concepts developed in the class.

The following letter grades will be assigned to the associated range of final grades: 90.0 – 100 A; 80.0 – 89.99 B; 70.0 – 79.99 C; 60.0 – 69.99 D; below 60 F.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WebAssign Homework</td>
<td>10%</td>
</tr>
<tr>
<td>Lab Reports</td>
<td>20%</td>
</tr>
<tr>
<td>Exploration</td>
<td>10%</td>
</tr>
<tr>
<td>Exams</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
</tbody>
</table>
# I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>SECTIONS</th>
<th>VIDEO LECTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction</td>
<td>12.1</td>
<td>Session 1</td>
</tr>
<tr>
<td>1/17-1/19</td>
<td>Coordinates in 3D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 2</td>
<td>Vectors</td>
<td>12.2</td>
<td>Session 1</td>
</tr>
<tr>
<td>1/22-1/26</td>
<td>Dot Product</td>
<td>12.3</td>
<td>Sessions 2 – 4</td>
</tr>
<tr>
<td></td>
<td>Determinant, Cross Product</td>
<td>12.4</td>
<td>Sessions 5 – 7</td>
</tr>
<tr>
<td>Week 3</td>
<td>Equations of Planes</td>
<td>12.5</td>
<td>Sessions 8, 15, 16</td>
</tr>
<tr>
<td>1/29-2/2</td>
<td>Cylinders and Quadric Surfaces</td>
<td>12.6</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Parametric Equations</td>
<td>13.1, 13.2</td>
<td>Sessions 15 – 18</td>
</tr>
<tr>
<td>Week 4</td>
<td>Velocity, Arc Length</td>
<td>13.3</td>
<td>Sessions 19, 20</td>
</tr>
<tr>
<td>2/5-2/9</td>
<td>Review</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Exam 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 5</td>
<td>Functions</td>
<td>14.1</td>
<td>Sessions 24 – 26</td>
</tr>
<tr>
<td>2/12-2/16</td>
<td>Partial Derivatives</td>
<td>14.3</td>
<td>Sessions 24 – 26</td>
</tr>
<tr>
<td></td>
<td>Tangent Planes</td>
<td>14.4</td>
<td>Session 27</td>
</tr>
<tr>
<td>Week 6</td>
<td>Tangent Planes</td>
<td>14.4</td>
<td></td>
</tr>
<tr>
<td>2/19-2/23</td>
<td>Chain Rule</td>
<td>14.5</td>
<td>Sessions 32 – 34</td>
</tr>
<tr>
<td></td>
<td>Gradient Vectors</td>
<td>14.6</td>
<td>Sessions 35 – 38</td>
</tr>
<tr>
<td>Week 7</td>
<td>Gradient Vectors</td>
<td>14.6</td>
<td></td>
</tr>
<tr>
<td>2/26-3/2</td>
<td>Extreme Values</td>
<td>14.7</td>
<td>Sessions 28, 30, 31</td>
</tr>
<tr>
<td></td>
<td>Lagrange Multipliers</td>
<td>14.8</td>
<td>Sessions 39 – 41</td>
</tr>
<tr>
<td>Week 8</td>
<td>Review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/5-3/9</td>
<td><strong>Exam 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Double Integrals</td>
<td>15.1, 15.2</td>
<td>Sessions 47 – 49</td>
</tr>
<tr>
<td>Holiday</td>
<td><strong>Spring Break!</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/12-3/16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 9</td>
<td>Polar Coordinates</td>
<td>10.3, 15.3</td>
<td>Session 50</td>
</tr>
<tr>
<td>3/19-3/23</td>
<td>Applications</td>
<td>15.4</td>
<td>Sessions 51, 52</td>
</tr>
<tr>
<td></td>
<td>Triple Integrals</td>
<td>15.6</td>
<td>Sessions 74, 75</td>
</tr>
<tr>
<td>Week 10</td>
<td>Cylindrical Coordinates</td>
<td>15.7</td>
<td></td>
</tr>
<tr>
<td>3/26-3/30</td>
<td>Spherical Coordinates</td>
<td>15.8</td>
<td>Sessions 76 – 78</td>
</tr>
<tr>
<td></td>
<td>Change of Variables</td>
<td>15.9</td>
<td>Sessions 53 – 55</td>
</tr>
<tr>
<td>DATE</td>
<td>TOPIC</td>
<td>SECTIONS</td>
<td>VIDEO LECTURES</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------</td>
<td>----------</td>
<td>----------------</td>
</tr>
<tr>
<td>Week 11</td>
<td>Change of Variables</td>
<td>15.9</td>
<td>Sessions 53 − 55</td>
</tr>
<tr>
<td>4/2-4/6</td>
<td>Review</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Exam 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 12</td>
<td>Vector Fields</td>
<td>16.1</td>
<td>Session 56</td>
</tr>
<tr>
<td>4/9-4/13</td>
<td>Line Integrals / Work</td>
<td>16.2</td>
<td>Sessions 58 − 60</td>
</tr>
<tr>
<td>Line Integrals / Work</td>
<td>16.2</td>
<td></td>
<td>Sessions 58 − 60</td>
</tr>
<tr>
<td>Week 13</td>
<td>Fundamental Theorem</td>
<td>16.3</td>
<td>Sessions 60 − 63</td>
</tr>
<tr>
<td>4/16-4/20</td>
<td>Exploration</td>
<td>16.3</td>
<td>Sessions 60 − 63</td>
</tr>
<tr>
<td>Curl and Divergence</td>
<td>16.5</td>
<td></td>
<td>Sessions 84, 90</td>
</tr>
<tr>
<td>Week 14</td>
<td>Curl and Divergence</td>
<td>16.5</td>
<td>Sessions 84, 90</td>
</tr>
<tr>
<td>4/23-4/27</td>
<td>Review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/30</td>
<td>Last Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5/7</td>
<td>Final Exam 11:00am-1:30pm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Changes in this course schedule may be necessary and will be announced to the class by the instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES

**Attendance/Tardiness**
Punctual class attendance is highly recommended.

**Late Work and Make-up Exams**
If a student misses an exam, the student’s grade on the final exam will serve as a replacement for the missed exam.

Late exploration assignments will receive a 5% penalty for each regular weekday that it is late (up to the last day of class).

Late lab assignments must be discussed with the lab instructor.

At any point before the last day of class, students may request past due WebAssign homework to be re-opened for partial credit. You will be able to earn 50% credit for any problems you have not answered correctly yet, and you will not be required to re-answer problems you have already answered correctly. You can request this type of homework extension through WebAssign or email.

The student’s two lowest homework grades and two lowest lab grades will be dropped. These drops are meant to cover all possible good excuses for late work, such as short term illness, technical problems, and family emergencies.

Long term illness and official university business are the only exceptions to these rules.
Extra Credit
There is no extra credit given in this course. Just study diligently throughout the semester.

Cell Phone Use
Please leave the room to use your phone.

Laptop Use
Please do not open laptops during class. This can distract others from learning, and part of my job is to provide a class atmosphere that aids student learning.

Food in Class
Please do not eat during class. This can distract others from learning, and part of my job is to provide a class atmosphere that aids student learning.

Missed Exam
See “Late Work and Make-up Exams” above.

Participation
Strong, consistent class participation is expected from all students.

K. COLLEGE AND UNIVERSITY POLICIES

- Academic Integrity (University)
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- Classroom/Professional Behavior
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructors ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- Statement of Civility
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are
responsible for following the rules of the University, city, state and federal govern-
ment. We expect that you will behave in a manner that is dignified, respectful and
courteous to all people, regardless of sex, ethnic/racial origin, religious background,
sexual orientation or disability. Behaviors that infringe on the rights of another
individual will not be tolerated.

- **Deadline for Dropping a Course with a Grade of W (University)** I hope
  that you never find it necessary to drop this or any other class. However, events
can sometimes occur that make dropping a course necessary or wise. Please consult
with your academic advisor, the Financial Aid Office, and me, before you decide to
drop this course. Should dropping the course be the best course of action, you must
initiate the process to drop the course by going to the Student Services Center and
filling out a course drop form. Just stopping attendance and participation WILL
NOT automatically result in your being dropped from the class. Please consult the
Academic Calendar at

http://www.tamucc.edu/academics/calendar/

for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)** As stated in Uni-
versity Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who
believes that he or she has not been held to appropriate academic standards as out-
lined in the class syllabus, equitable evaluation procedures, or appropriate grading,
may appeal the final grade given in the course. The burden of proof is upon the
student to demonstrate the appropriateness of the appeal. A student with a com-
plaint about a grade is encouraged to first discuss the matter with the instructor.
For complete details, including the responsibilities of the parties involved in the
process and the number of days allowed for completing the steps in the process,
see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These
documents are accessible through the University Rules website at

http://www.tamucc.edu/provost/university_rules/index.html

and the College of Science and Engineering Grade Appeals webpage at

http://sci.tamucc.edu/students/GradeAppeal.html

For assistance and/or guidance in the grade appeal process, students may contact
the chair or director of the appropriate department or school, the Office of the
College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute
that provides comprehensive civil rights protection for persons with disabilities.
Among other things, this legislation requires that all students with disabilities be
guaranteed a learning environment that provides for reasonable accommodation of
their disabilities. If you believe you have a disability requiring an accommodation,
please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

http://disabilityservices.tamucc.edu/

• **Statement of Academic Continuity**

In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**

• **Academic Advising**

The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

**GENERAL DISCLAIMER**

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.