MTH 2254
Calculus IV

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A full list of committee members can be found at
http://www.austinecc.edu/mthdept5/mman06/cdocs/coursecommittees

Notes for Instructors
2006-2007


A Student Solution Guide and an Answer Book for Even-Numbered Problems accompanies the Marsden & Tromba text (ISBN 0716705281). The Student Solution Guide provides solutions for selected odd-numbered problems. It can be purchased at the bookstore but, because of its relatively high cost to students, some instructors have opted to place copies on reserve for two-hour loan in the LRS. The Answer Book for Even-Numbered Problems is available for instructor use only. Course committee members can answer additional questions about this text.

The text does not require computer/calculator support for programming or for graphing applications, but you may want to take advantage of software appropriate for this course. The College has site licenses available for DPGraph (a 3-D graphing program) and for Mathematica (a professional level computer algebra program), both of which are available on all computers in the math computer classrooms. DPGraph and WINPlot are available for student download and use at home as well. Check with the course committee or the chair of the math Technology Committee for further information if you aren’t sure how to access these programs or have other technology questions.

MTH 2254 is a sequel to the traditional calculus sequence and is taken primarily by students majoring in electrical or aeronautical engineering, physics, or mathematics. It transfers to UT-Austin as M427L. ACC is changing our course numbers to the Texas Common Course Numbers, but this course number has not changed. This is considered a "Special Topics" course in the state's list of courses for community colleges and at some point we will create a "special topics" number for this course in the style of the Texas Common Course Numbers. The lack of a Texas Common Course Number does not jeopardize transferability -- it merely means that one must look at the transfer equivalency guides of the two schools. The instructor will be notified when the process is complete and the course number changes.

A few of the topics in this course were previously introduced in MATH 2415 - Calculus III (the gradient vector, parametrization of curves, arc length, multiple integration) but now in significantly more detail. Since applications of this course are generally in two and three dimensions, it is recommended that theorems and proofs be discussed in two or three dimensions only. Also, keep in mind that most vector calculus students are taking this course to improve their understanding of physics and engineering. Proofs are of less significance than applications. Students want to see the "big picture" of what vector calculus is all about. The following sorts of questions illustrate major ideas in this course:

1. What do divergence and curl mean geometrically?
2. How can the change-of-variable theorem be illustrated?
3. What are the primary applications of multiple integration that these students will soon be seeing in other courses?
4. Why does a line integral compute work and circulation; why do certain surface integral measure flux?
5. How can multiple integrals, line integrals, and surface integrals be evaluated by inspection?
6. How can we recognize opportunities to use Green's theorem, Stokes' theorem, the divergence theorem?
7. How can Maxwell's equations be expressed in terms of vector calculus?

Other texts that you may wish to use for reference purposes include *Vector Calculus*, a photocopied manuscript by Dennis Allison (available from the course committee), *Multivariable Calculus* by Hurley, Benjamin Cummings Pub. (a text we used in the 1980's and available in the LRS) and *College Outline Series: Vector Analysis* by Hsu, HBJ and Co. (for additional problems). For the Allison manuscript there is a complete set of answers and partial solutions available for instructor use only.

You are expected to provide students with a first-day handout that answers typical student questions: How many exams? (4 or 5 exams are recommended.) Is the final exam comprehensive? (Your choice) Is homework collected and graded? (It is recommended that you either have some homework-grading scheme or give homework quizzes.) What is your attendance policy, if any? How is the semester grade determined? Where and what are your office hours? How may students contact and / or leave messages for you?

You may wish to develop your own testing scheme or consider what some previous instructors have done.

Exam #1 - Chapter 2
Exam #2 - Chapter 4
Exam #3 - Chapters 5/6
Exam #4 - Chapter 7
Exam #5 - Chapter 8

You have the option of giving some or all of the exams in the Testing Center at your campus. To do so, you should place multiple versions of the exam in the Testing Center several days prior to the initial test date. Check with the Testing Center for specific instructions on how this is done.

You will likely want to briefly review parameterization of curves in two and three dimensions prior to introducing path/line integrals (Chapter 7). Parameterization is used even earlier in the discussion of flow lines (Chapter 4) but previous students have had little difficulty with the flow-line discussion.

Best wishes to you in teaching this course.
First Day Handout for Students

[MTH 2254- [section number] [Instructor Name] [Semester] [Instructor ACC Phone]
Synonym: [insert] [Instructor email]
[Time], [Campus] [Room] [Instructor web page, if applicable]
[Instructor Office] Office Hours: [day, time]
Other hours by appointment

COURSE DESCRIPTION

MTH 2254 CALCULUS IV (4-4-0). This course develops the calculus of real- and vector-valued functions of one and several variables. Topics include matrix algebra and linear maps; vector-valued functions and their analysis; the geometry of Euclidean n-space; functions of several variables and their differentiation; gradients and directional derivatives; partial derivative; arc length; vector fields, divergence, and curl; Taylor's theorem for several variables; extreme of real-valued functions in n-space; LaGrange multipliers; multiple integrals and the chain rule; improper integrals; line integrals; area of surface; surface integrals; Green's Theorem; Gauss' Theorem; Stokes' Theorem; conservative fields. Prerequisites: MATH 2415 or its equivalent.

REQUIRED TEXTS/MATERIALS

The required textbook for this course is:

INSTRUCTIONAL METHODOLOGY

This course is taught in the classroom primarily as a lecture/discussion course.

COURSE RATIONALE

This course serves as an extension of the traditional calculus sequence and contains additional topics relevant to students majoring in engineering, physics, and applied mathematics, including:

1. differentiability generalized to multivariable functions
2. an introduction to vector fields and flow lines
3. a description of four differential operators: gradient, divergence, curl, and Laplacian
4. the change-or-variables theorem for double and triple integrals
5. path integrals and line integrals
6. parametrization of surfaces
7. surface integrals
8. Green's theorem, Stokes' theorem, the divergence theorem
9. conservative vector fields
10. Maxwell's equations

COMMON COURSE OBJECTIVES

Common course objectives need to be printed out and included in the first day handout.

http://www2.austin.cc.tx.us/mthdept2/tfcourses/obj2254.htm
COURSE EVALUATION/GRADING SCHEME
Grading criteria must be clearly explained in the syllabus. The criteria should specify the number of exams and other graded material (homework, assignments, projects, etc.). Instructors should discuss the format and administration of exams. Guidelines for other graded materials, such as homework or projects, should also be included in the syllabus.

The following policies are listed in First Day Handout section in front part of the Math Manual or on website at [http://www2.austincc.edu/mthdept5/mman06/statements.html](http://www2.austincc.edu/mthdept5/mman06/statements.html) Insert the full statement for each of the following in your syllabus:

Statement on Scholastic Dishonesty

Recommended Statement on Scholastic Dishonesty Penalty

Recommended Statement on Student Discipline

Statement on Students with Disabilities

Statement on Academic Freedom

COURSE POLICIES
The syllabus should contain the following policies of the instructor:
- missed exam policy
  - policy about late work (if applicable)
- class participation expectations
- reinstatement policy (if applicable)

Attendance Policy (if no attendance policy, students must be told that)
The recommended attendance policy follows. Instructors who have a different policy are required to state it.
Attendance is required in this course. Students who miss more than 4 classes may be withdrawn.

Withdrawal Policy (including the withdrawal deadline for the semester)
It is the student's responsibility to initiate all withdrawals in this course. The instructor may withdraw students for excessive absences (4) but makes no commitment to do this for the student. After the withdrawal date, neither the student nor the instructor may initiate a withdrawal.

Incomplete Grade Policy
Incomplete grades (I) will be given only in very rare circumstances. Generally, to receive a grade of "I", a student must have taken all examinations, be passing, and after the last date to withdraw, have a personal tragedy occur which prevents course completion.
Course-Specific Support Services
Sometimes sections of MATH 0199 (1-0-2) are offered. The lab is designed for students currently registered in Calculus IV, MATH 2254. It offers individualized and group setting to provide additional practice and explanation. This course is not for college-level credit. Repeatable up to two credit hours. Students should check the course schedule for possible offerings of the lab class ACC main campuses have Learning Labs which offer free first-come first-serve tutoring in mathematics courses. The locations, contact information and hours of availability of the Learning Labs are posted at: http://www.austincc.edu/tutor

COURSE OUTLINE/CALENDAR

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<td>12</td>
<td>Sections 7.5-7.6</td>
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Instructors are encouraged to add a statement of variance, such as “Please note: schedule changes may occur during the semester. Any changes will be announced in class.”

TESTING CENTER POLICY
ACC Testing Center policies can be found at: http://www.austincc.edu/testctr/
Instructor will add any personal policy on the use of the testing center.

STUDENT SERVICES
The web address for student services is: http://www.austincc.edu/rss/index.htm
The ACC student handbook can be found at: http://www.austincc.edu/handbook

INSTRUCTIONAL SERVICES
The web address is: http://www.austincc.edu/faculty/newsemester/
then click on “Campus Based Student Support Overview”. 