Mathematics F202: Calculus III
Section F01, Spring 2015

Instructor: John Rhodes, `j.rhodes@alaska.edu` 102 Chapman, 474-5445

Office Hours: T 11:00-12:00, W 2:00–3:00, F 10:30–11:30, and by appointment

Course website: `http://www.dms.uaf.edu/~jrhodes/M202.html`

Prerequisites: Math 201, with a grade of C– or better

Credit Hours: 4.0

Text: <u>Calculus</u> (early transcendentals), 5th ed., by Larson and Edwards, Brooks/Cole; custom UAF edition includes only chapters 11-15.

Online homework: WebAssign, `https://www.webassign.net`, Class key: `uaf 3137 8317`

Class Meetings: M T W F 8:00–9:00, in Duckering 252 (MWF) and Gruening 208 (T)

In-class Exams: (Tentative) Monday, February 16; Monday, April 6

Final Exam: 8:00–10:00, Tuesday, May 5

Course overview and goals:

Though you have must have completed a year of college-level calculus to be in this course, you've only seen the subject used in very special circumstances, when functions have only one variable.

In the real world, most things do not depend on just one variable. For instance, the temperature at any point in space might depend on the 3 variables giving the coordinates of the point. Moving from point to point in any of the x-, y-, or z-directions may produce a change in temperature. For a situation such as this, what do we mean by a derivative?, an integral?

In a slightly different direction, consider a planet orbiting the sun. While the planet's position is a function of time, it really has three components (the x-, y-, and z- coordinates), so we need three functions of the sort you are used to in order to talk about 'the' position function. What should a derivative mean for this sort of three-fold function, and how might it occur in an integral?

Our goal for the semester is to extend your knowledge of calculus into the two- and three-dimensional settings that naturally occur in most situations in the sciences and engineering. You will use heavily all the material from Calculus I and II, as we will ultimately see that all the calculational rules for derivatives and integrals learned there can be used in this new multidimensional setting. However, you will learn new conceptual frameworks that enable you to apply these known rules.

This material is essential for further study in mathematics, the physical sciences, and engineering. It also appears often in some branches of economics and the biological sciences as well.

Finally, be warned that understanding two and three dimensions mathematically is harder for many students than they might at first expect. You will have to think hard about the material. It is challenging, but also very rewarding.

Mechanics of the course:

Class meetings: The class will be run as an interactive lecture. That means that while I will be presenting material at the board, and you will be taking notes, I will also be asking for suggestions, ideas, and questions about the material as we go along. I don't expect 'correct' answers, but I do expect you to be actively following and participating — that makes the class more interesting for us all.

I'll begin each class by asking if any questions have come up from the last lecture or most recent homework. Please use this opportunity to get clarification on any points of confusion; your classmates will appreciate you asking the questions they are too shy to bring up. However, be aware that I will usually not discuss material from before the last class — you can see me in office hours for that, but I will want to keep the class meetings moving forward.

Class attendance is expected, although I will not formally take roll. If you must miss a class, you should get notes from another student.

Quizzes: Short, unannounced quizzes will be given randomly throughout the semester, roughly once per week. These will typically take 10-15 minutes and be similar to recent homework. These serve two primary purposes 1) to encourage you to be present in every class and 2) to ensure that you stay current with the homework. If you expect to miss a class, you should talk to me in advance about having any potential quiz waived — you must have a good reason and (except for emergencies) you cannot get retroactive approval.

Homework: Homework using the WebAssign on-line system will be assigned daily, by 11:00am following the class meeting. To stay current you should complete these assignments *before* the next class meeting. However, the formal due date and time will be at 11:59pm two weekdays (*i.e.*, omitting holidays and weekends) after the class for which the assignment is made. For instance, a Monday assignment is due Wednesday night. You may resubmit your assignment up to 3 times within that period without penalty.

If you do not complete the entire assignment by the deadline you may request (through WebAssign) an extension. This will be automatically granted, and gives you 2 extra days to complete the assignment. Work submitted in an extension can earn at most 50% of the full score. Note that while the original 2 days for an assignment counts only weekdays, *the 2-day extension includes weekends and holidays*. Be sure you submit any work you can before the original deadline, so that it can earn full points.

Around three additional written homework problems will be assigned for each section of the book, and collected each Tuesday. The presentation of your work will be taken into account in the grading of these. Written homework assignments will be announced in class and posted on Blackboard soon afterwards.

I encourage you to work with others on all homework, but you must enter solutions in WebAssign or produce your written solution independently. You will learn nothing from simply copying someone's solution.

I will not allow any late homework that has not been cleared ahead of time or is not due to a genuine emergency (e.g., a death in the family, or a medical problem with a doctor's note).

Exams: The two midterm exams are not cumulative; they will cover only material since the last exam. The final is cumulative, but will emphasize material after the second midterm.

All exams are closed book, with no notes allowed. No make-up exams will be given without prior approval, except in extreme circumstances (e.g., family death, documented illness).

Missed examinations without prior approval will result in an 'F' on that exam. No make-up exams will be given except in extreme circumstances (e.g., family death, documented illness). Notifying me by email or a note that you will miss an exam is generally not sufficient for advance approval; if possible, you must speak with me to be excused.

Tutoring: No-cost, walk-in help is available at the Math Lab in Chapman 305. Hours will be announced, and posted on the door and the web. A good way to use the Math Lab is to simply go there to do your homework, so that if any questions come up you can get immediate help.

Calculators: I have no strong feelings on whether you use a calculator when doing homework. As long as you are sure you have the skills to do all calculations by hand, it is fine for you to use technology as a time saver. However, *no calculators will be allowed on any examinations or quizzes.* This will ensure that testing conditions are equal for everyone.

Grades: Your performance will be evaluated based on 5% quizzes, 5% online WebAssign homework, 10% written homework, 25% first midterm exam , 25% second midterm exam, 30% final exam.

Course grades will be determined according to the following cutoffs:

$$A \geq 90\%,$$
$$B \geq 80\%,$$
$$C \geq 70\%,$$
$$D \geq 60\%,$$

with $+/-$ for the top and bottom few points in each range. I reserve the right to move the cutoff points downward if particular exams turn out to be unexpectedly difficult. Note that you are not in competition with your peers – everyone in the class may get an A, or everyone may get an F.

University and Department Policies: Your work in this course is governed by the UAF Honor Code. The Department of Mathematics and Statistics has specific policies on incompletes, late withdrawals, and early final exams which can be found at
                    http://www.dms.uaf.edu/dms/Policies.html.

If you have any disabilities that I should know about, you should bring them to my attention soon so that we can work with the Office of Disability Services to set up any necessary accommodations.

Tentative Schedule

Week 1	Jan. 16 – 23	§11.1, 2, 3: 2- and 3-dimensional space, vectors, dot products
Week 2	Jan. 26 – 30	§11.4, 5, 6: cross products, lines and planes, surfaces
Week 3	Feb. 2 – 6	§11.7, 12.1, 2: polar, cylindrical, spherical coordinates vector-valued functions, derivatives and integrals of vector functions
Week 4	Feb. 9 – 13	§12.3, 4, 5: velocity and acceleration, tangent and normal vectors, curves and arc length
Week 5	Feb 16 – 20	EXAM 1 Monday (Chapters 11 and 12) §13.1, 2, 3: functions of several variables, limits and continuity, partial derivatives
Week 6	Feb 23 – 27	§13.4, 5, 6, 7: differentials, the chain rule gradients and directional derivatives, tangent planes
Week 7	March 2 – 6	§13.8, 9, 10: extrema and optimization, Lagrange multipliers
Week 8	March 9 – 13	§14.1, 2, 3: integrals over 2-d regions, iterated integrals, integrals in polar coordinates
	March 16 – 20	SPRING BREAK
Week 9	March 23 –27	§14.3, 4, 5: integrals in polar coordinates, center of mass, surface area
Week 10	March 30 –April 3	§14.6, 7, 8: integrals over 3-d regions, integrals in cylindrical and spherical coordinates, change of variables
Week 11	April 6 – 10	EXAM 2 Monday (Chapters 13 and 14); §15.1, 2: vector fields, curl and divergence, line integrals
Week 12	April 13 – 17	§15.2, 3, 4: Fundamental Theorem for line integrals, conservative fields, path independence, Green's Theorem
Week 13	April 20 – 22	§15.4, 5: Green's Theorem, parameterized surfaces, SPRINGFEST
Week 14+	April 27 – May 4	§15.6, 7, 8: surface integrals, the Divergence Theorem Stokes' Theorem, final review