Course Description

Einstein invented the theory of special relativity in the early 20th century to accomodate the empirical fact that the speed of light is the same for all observers, regardless of their relative motion. Under this theory, the arena for physics becomes Minkowski spacetime, and this leads to a notion of geometry quite different from Euclidean space. Einstein's companion theory, general relativity, describes how gravity arises because spacetime isn't exactly Minkowski, but is curved. Each point of spacetime looks locally like Minkowski space in the same way that a neighbourhood of a point on the sphere looks like a plane if you zoom in closely. In this class we will study these ideas at the junction between math and physics. Math students will be exposed to a branch of physics with profound mathematical consequences, and physics students will see a more mathematical approach to this material than they may have seen in the past. In particular, we will introduce machinery from differential geometry as we study general relativity.

Essential Information

Professor	David Maxwell
Office	Chapman 308C
Email	`damaxwell@alaska.edu`
Phone	474-1196
Web	`http://damaxwell.github.io`
Required Texts	**Special Relativity** and **General Relativity**, *N.M.J. Woodhouse*, Springer

Prerequisites:

Permission of instructor.

Class Time

There will be three hours of class lecture each week.

Lecture Times		
MWF	9:15–10:15	Greuning 308

Office Hours

My office hours will be posted on my web site and outside my office door. You are welcome to schedule an appointment outside of my regular office hours; please send me an email and we will arrange a time.

Piazza

We will use the Piazza social media site for announcements and after-class questions and discussions. See the course web page for instructions on how to sign up.

Homework

There will be a homework assignment due roughly every week, usually on Mondays. Each week's assignment and due date will be announced in class and will be posted on my web page.

Regarding late homework, I will accept from each student a single late homework with no questions asked. To take advantage of this opportunity, simply hand in a piece of paper in lieu of your homework notifying me that you are using your free late assignment. Your late homework will be due when the subsequent homework is due, or one week later, whichever comes first. Exceptions: you may not use your freebie for either of the first two, or the last homework assignments.

Subsequent late homeworks will be accepted only under extenuating circumstances to be determined at my discretion.

Midterm

There will be one in-class midterm exam. It is tentatively scheduled to be held on Friday, October 26.

Final Exam

General relativity and differential geometry are computationally intensive. So there will be a take-home take-home final exam. More details will be announced later in the semester.

Evaluation

Course grades will be determined as follows:

Homework	50%
Midterm	20%
Final	30%

Letter grades will be assigned according to the following scale. This scale is a guarantee; I also reserve the right to lower the thresholds.

A+	97–100%	C+	77–79%	F	< 60
A	93–96%	C	73–76%		
A-	90–92%	C-	70–72%		
B+	87–89%	D+	67–69%		
B	80–86%	D	63–66%		
B-	not given%	D-	60–62%		

Tentative Schedule

The following is a tentative list of the topics to be covered in this class. As we proceed in the course, the course web page will list specific sections to be read for each week.

Week	Topics and Events
9/5	SR Chapter 1
9/8 – 9/12	SR Chapter 4
9/15 – 9/19	SR Chapter 5
9/22 – 9/26	SR Chapter 6
9/29 – 10/3	SR Chapter 7
10/6 – 10/10	Maxwell's Equations
10/13 – 10/17	GR Chapters 1 & 2
10/20 – 10/24	GR Chapter 3
10/27 – 10/31	GR Chapter 4 Friday: Last day to withdraw with a 'W' Friday: Midterm
11/3 – 11/7	GR Chapter 4
11/10 – 11/14	GR Chapter 5
11/17 – 11/21	GR Chapter 5
11/24 – 11/28	GR Chapter 6 Thursday/Friday: Thanksgiving (no classes)
12/1 – 12/5	GR Chapter 7
12/8 – 12/12	GR Chapter 8 Friday: Last day of class

Rules and Policies

Collaboration

You are encouraged to work together in solving homework problems. But each student must write up his or her own solutions independently. If you receive significant help solving a problem, it is customary to make a note in your homework to give the person who helped you credit.

Makeup Exams

You can make up an exam if certain extenuating circumstances prevent you from taking it and if you inform me in advance. Contact me as soon as possible if you are going to miss an exam.

Attendance

Attendance is not included directly as part of your grade.

Cell Phones

Turn off your cell phone before you come to class. No texting during class, please.

Disabilities Services

I will work with the Office of Disabilities Services (203 Whitaker, 474-7043) to provide reasonable accommodation to students with disabilities.

Incomplete Grade
Incomplete (I) will only be given in Computer Science, Mathematics or Statistics courses in cases where the student has completed the majority (normally all but the last three weeks) of a course with a grade of C or better, but for personal reasons beyond his/her control has been unable to complete the course during the regular term. Negligence or indifference are not acceptable reasons for the granting of an incomplete grade. (Note: this is essentially the old University policy.)

Late Withdrawals
A withdrawal after the university deadline from a Department of Mathematical Sciences course will normally be granted only in cases where the student is performing satisfactorily (i.e., C or better) in a course, but has exceptional reasons, beyond his/her control, for being unable to complete the course. These exceptional reasons should be detailed in writing to the instructor, department head and dean.

Academic Dishonesty
Academic dishonesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.