Course Description:

This is a one semester, graduate topics course on Symplectic Geometry. Symplectic geometry is the geometry underlying Hamilton’s formulation of classical mechanics. It sits at the intersection of many different areas — there are relationships with topology, geometry, analysis, algebra, and dynamics — and is a very rich subject. The main goal of the course will be to illustrate some standard elements of the theory and expose participants to some of the current research going on about the topic.

Learning Goals for the Course:

My main goals for the course are as follows. By the end of the course you should:

- Know the basic key results and proofs in the subject
- Get exposure to current research in the area
- Interact actively with the material and explore your individual interests

I also hope to transmit my personal excitement about the material to you!

Prerequisites:

I will assume that students are familiar with the basics of differential forms, smooth manifolds, calculus on manifolds, and some differential equation theory. When discussing certain special topics, I will sometimes use facts from other branches of mathematics that it would be helpful for you to have seen before, but previous experience will not be strictly necessary: for more about this, I recommend that you read
the final two paragraphs of the McDuff-Salamon reference (see below), that explains this well. If you have not fulfilled the prerequisites and still want to take the class, or are at all worried about your background for the class, I urge you to contact me as soon as possible and we can set up a time to meet and discuss.

**Textbooks:**

We will be using a variety of sources for the class, with an emphasis on sources that are available for free online. However, I do ask that you obtain a copy of *Introduction to Symplectic Topology*, by McDuff-Salamon, which is the canonical reference in the subject. We will not be following everything in that book, but it will certainly guide our treatment; if you are having trouble getting a copy, please let me know. Another great reference (available for free) are the lecture notes *Lectures on Symplectic Geometry* by Ana Canas da Silva.

There will also be many “handouts”, linked or posted electronically on the webpage, as appropriate. This will be particularly relevant when we get more into some of the current research topics in the area.

**Email and Website:**

There is a website for this course, currently at https://dancg.sites.ucsc.edu/teaching/math-848l-symplectic-geometry/. I will periodically post very short lecture summaries there. I will also post clarifying notes from time to time. If many students ask me a similar question, I will post a response there.

My email is dcristof@umd.edu. You are highly encouraged to email me with any questions that you might have. I will try to respond to all emails with 48 hours.

**Grading:**

It is important that you interact regularly with the material to get the most out of the course. Different students have different preferences for how these interactions should go, so I allow several different pathways.
To elaborate, you will be able to earn 30 possible points across three homeworks, 20 points for an in-class presentation, 20 points for a final paper, and 5 points for class participation. I will grade anything you hand in to me, and I will cap your maximum total points at 50; that is a 50/50 will be a perfect grade. So, for example, if you do not want to do too much homework, you could in principle give a strong presentation, write a final paper, and do just one homework assignment. Alternatively, if you want, you can attempt all possible grading items, and then you will have more of a buffer in case, for example, you make mistakes on your homework.

Presentations can be done in groups of up to three. I will help find suitable topics for presentations and papers, and you will have a lot of flexibility in pursuing your own interests.

In terms of how I will measure class participation, you will have many ways to earn these points; for example, one way to earn these points is by taking lecture notes, but there are others, too. To emphasize, you are not required to ask questions to earn these points, and you are encouraged to communicate to me your preferences for how you can best participate in class.

Homework assignments will be posted to the course website.

A note on flexibility:

As this is a small graduate course, we have some flexibility to tailor the lectures to student needs. If there is something you would like to hear about, please let me know!