



# 2023 Fall Individual Report FAS-MATH 136-Differential Geometry 001 Puskar Mondal

Project Title: **2023 Fall Harvard FAS Course Evaluation**

Course Audience: **25**

Responses Received: **22**

Response Ratio: **88%**

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## Report Comments

Note:

The order that the questions appear on this report is not the same as the way the questions were displayed to students. The order has been changed to make the report more readable.

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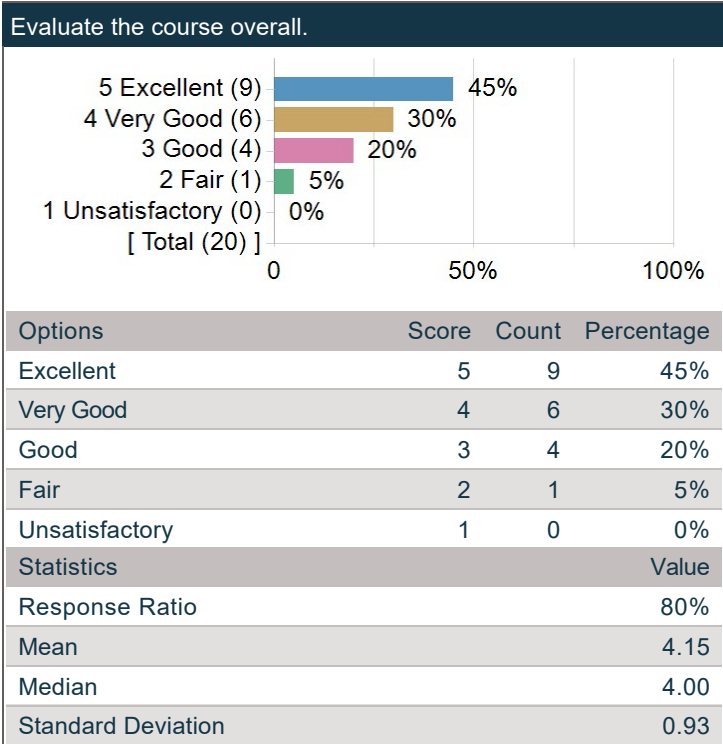
Creation Date: **Tuesday, January 2, 2024**

General Course Questions

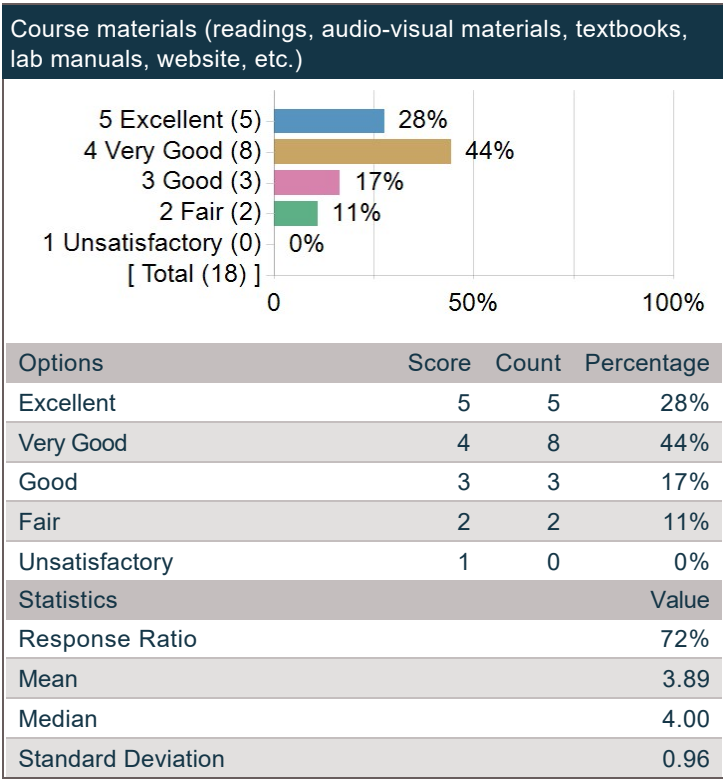
Course General Questions

	Count	Excellent	Very Good	Good	Fair	Unsatisfactory	Course Mean	Dept Mean	Division Mean
Evaluate the course overall.	20	45%	30%	20%	5%	0%	4.15	3.77	4.06
Course materials (readings, audio-visual materials, textbooks, lab manuals, website, etc.)	18	28%	44%	17%	11%	0%	3.89	3.92	4.13
Assignments (exams, essays, problem sets, language homework, etc.)	20	35%	30%	25%	5%	5%	3.85	3.66	3.91
Feedback you received on work you produced in this course	20	45%	35%	15%	5%	0%	4.20	3.71	3.95
Section component of the course	6	50%	33%	17%	0%	0%	4.33	3.91	4.16

Evaluate the course overall.



Course materials (readings, audio-visual materials, textbooks, lab manuals, website, etc.)

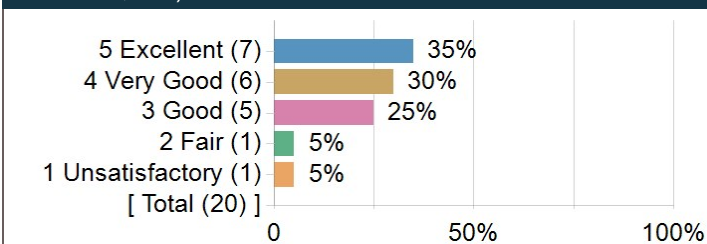


Add comments about course materials?

Comments
Notes should have been updated more regularly, especially after lectures in the middle of the semester. The amount of rigor required was also completely unclear in a lot of places (e.g., some homework problems were beyond the scope of this class, but this was not communicated)
The class notes were essential to supplementing the lectures.
I liked the published class notes.
Again it would be really helpful if there were more visual explanations—it is difficult to see the "geometry" of differential geometry when done using a purely algebraic lens. A supplementation with materials from Visual Differential Geometry and forms would do wonders. Also, this is a stretch but animations from 3blue1brown's Manim library would make stuff easy to understand.
There was no textbook and the lectures were not very rigorous, so this was unsatisfactory. However, he put together great lecture notes!
Would appreciate assigned reading
Course notes were fantastic.

**Assignments (exams, essays, problem sets, language homework, etc.)**

Assignments (exams, essays, problem sets, language homework, etc.)

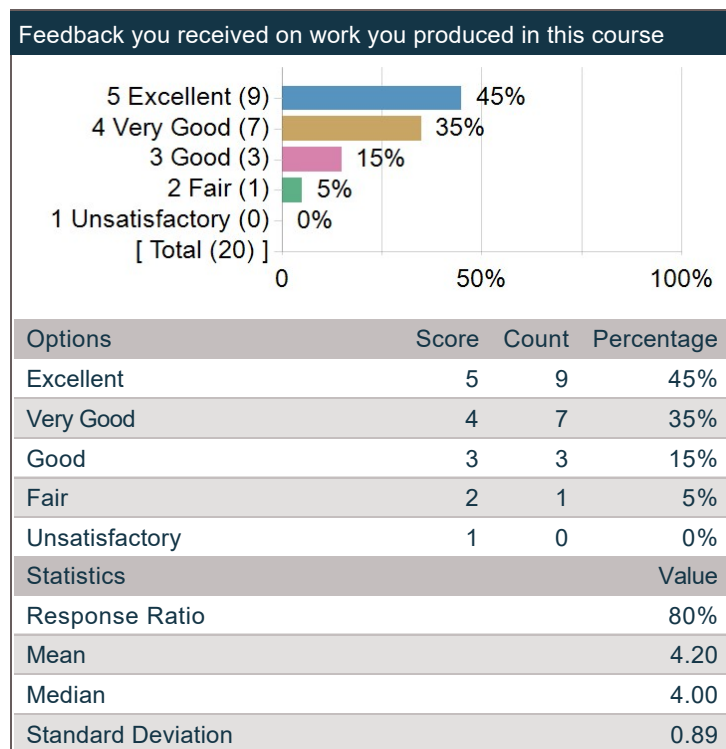


Options	Score	Count	Percentage
Excellent	5	7	35%
Very Good	4	6	30%
Good	3	5	25%
Fair	2	1	5%
Unsatisfactory	1	1	5%
Statistics			Value
Response Ratio			80%
Mean			3.85
Median			4.00
Standard Deviation			1.14

**Add comments about course assignments?**

Comments
Psets were really helpful – exams were fair since they were based off the practice ones, but they were unnecessarily long.
I really liked the hints on the earlier problem sets since they streamlined my thinking and made everything take less time. It would have been nice to have them on later problem sets, too.
I liked the amount of problem sets, but they were often very long and confusing to do without help. The midterm and the final were also extremely long, hardly anyone finished before 3.5 hours.
The assignment were probably the best part of the course, I learnt the most here
Exams were a little frustrating since it was mostly a scavenger hunt through the notes and then copying things down. However, the homework was really cool! He did an amazing job pulling things in from topology and algebra while still keeping it doable.
Pretty illuminating
PSETs and tests sometimes felt a bit removed from the course materials.
PSETS are impossible without OH. Exams are a waste of time because of copying and no one can finish them. It is good though that PSETS can be done collaboratively because I learned the most while doing them.

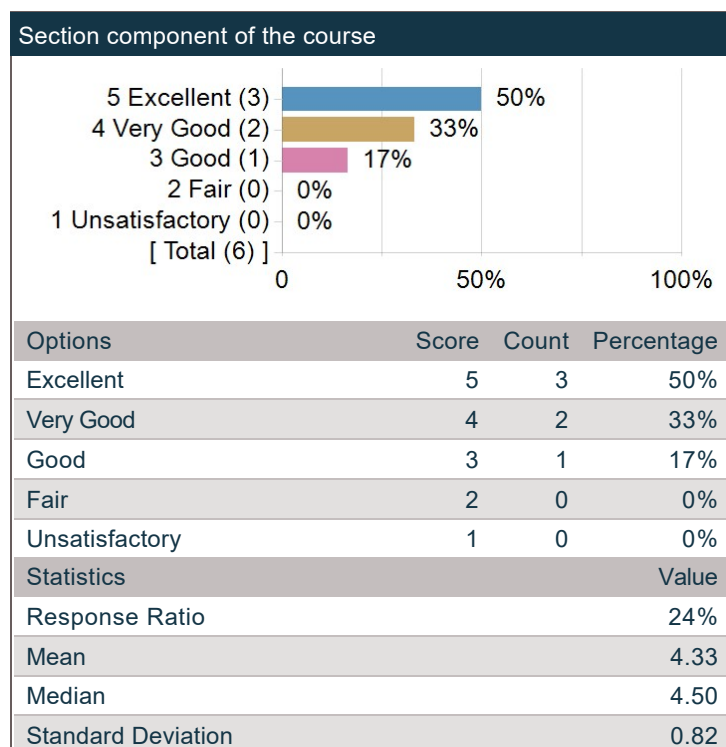
## Feedback you received on work you produced in this course



## Add comments about course feedback?

Comments
CA comments were very good at pointing out flaws; not very good at suggesting how I fix said flaws.
He was great with feedback at all times.
Feedback by Puskar was great. CA feedback lacked content and clarification.

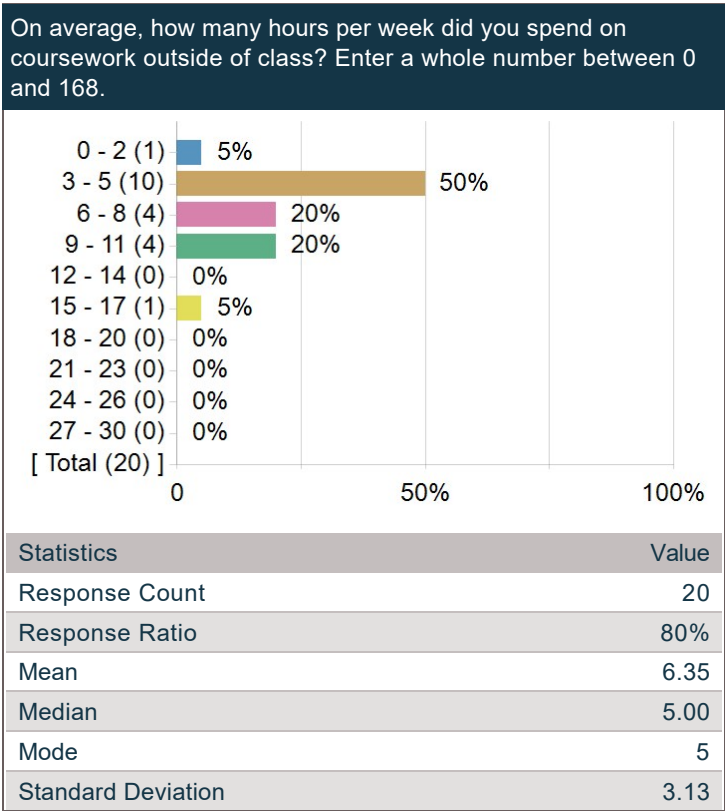
## Section component of the course



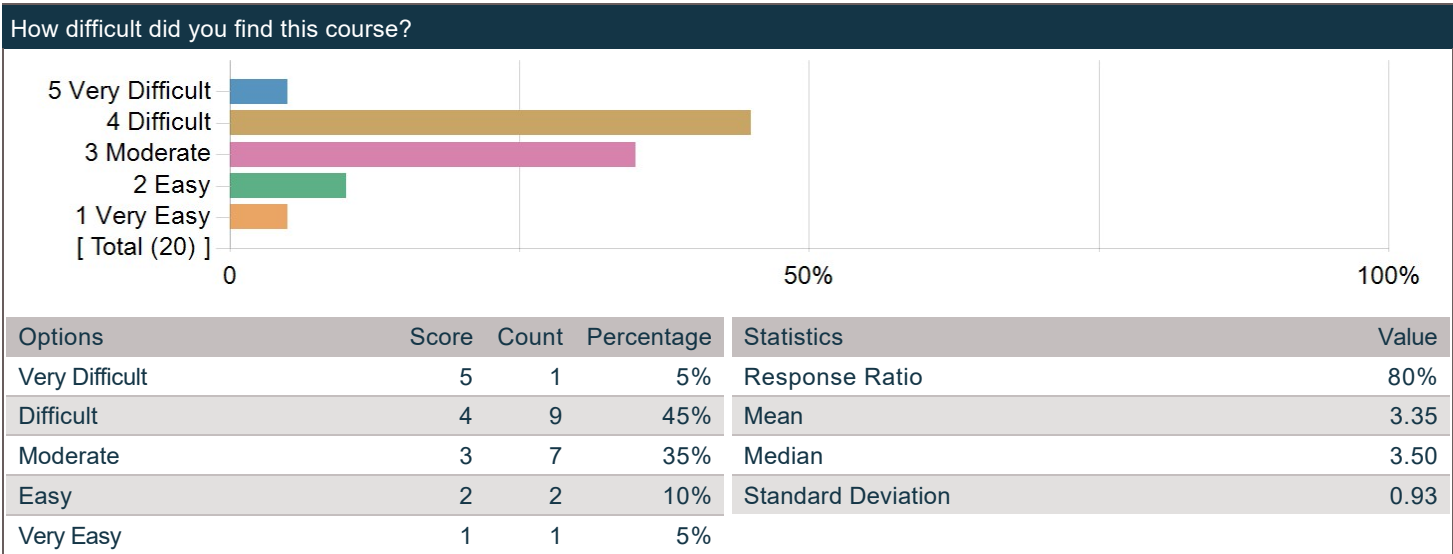
Requirements - What did this course require of you?

On average, how many hours per week did you spend on coursework outside of class? Enter a whole number between 0 and 168.

Frequency chart and mean excludes students who answered 31 or more hours.

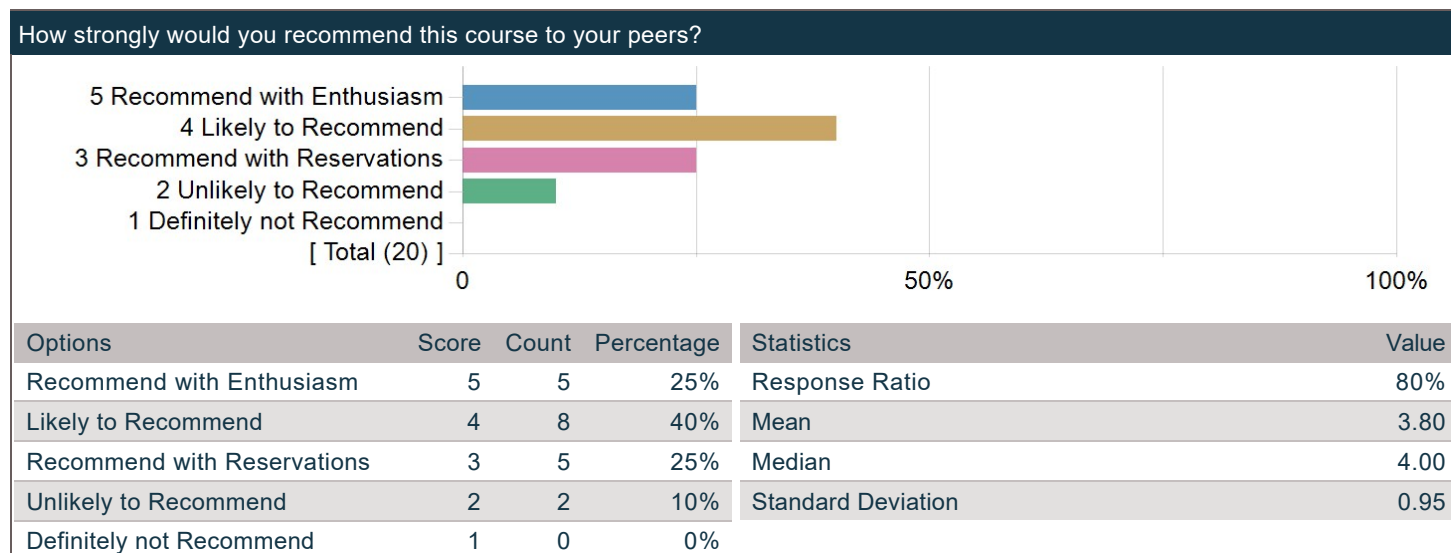


How difficult did you find this course?



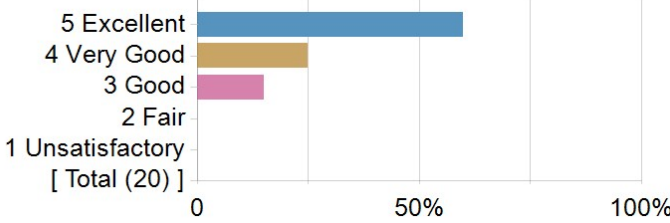
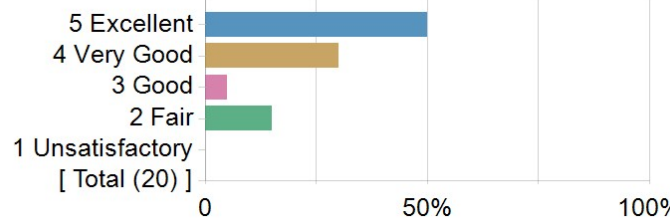
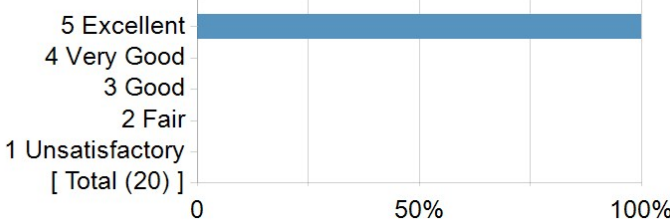
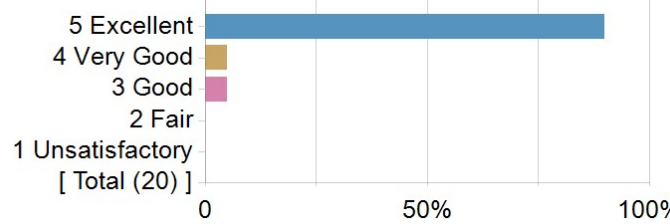
**What was/were your reason(s) for enrolling in this course? (Please check all that apply)**

Options	Count
Elective	3
Concentration or Department Requirement	17
Secondary Field or Language Citation Requirement	0
Undergraduate General Education Requirement	0
Expository Writing Requirement	0
Foreign Language Requirement	0
Pre-Med Requirement	0
Divisional Distribution Requirement	1
Quantitative Reasoning with Data Requirement	1

**Recommendations - Would you recommend this course?****How strongly would you recommend this course to your peers?****Evaluation of Instructors****General Instructor Questions**

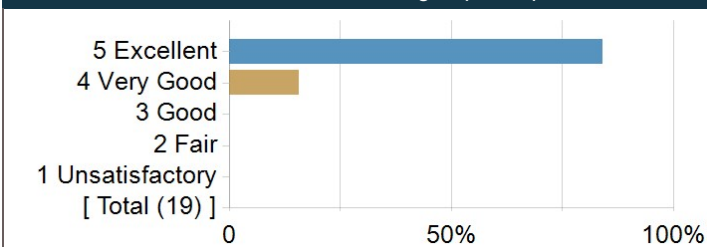
	Count	Excellent	Very Good	Good	Fair	Unsatisfactory	Instructor Mean	Dept Mean	Division Mean
Evaluate your Instructor overall.	20	60%	25%	15%	0%	0%	4.45	4.24	4.46
Gives effective lectures or presentations, if applicable	20	50%	30%	5%	15%	0%	4.15	4.03	4.33
Is accessible outside of class (including after class, office hours, e-mail, etc.)	20	100%	0%	0%	0%	0%	5.00	4.44	4.49
Generates enthusiasm for the subject matter	20	90%	5%	5%	0%	0%	4.85	4.43	4.53
Facilitates discussion and encourages participation	19	84%	16%	0%	0%	0%	4.84	4.38	4.48
Gives useful feedback on assignments	12	92%	8%	0%	0%	0%	4.92	4.21	4.45
Returns assignments in a timely fashion	15	87%	7%	0%	7%	0%	4.73	4.15	4.45

**Instructor**

1. Evaluate your Instructor overall.					2. Gives effective lectures or presentations, if applicable				
									
Options	Score	Count	Percentage		Options	Score	Count	Percentage	
Excellent	5	12	60%		Excellent	5	10	50%	
Very Good	4	5	25%		Very Good	4	6	30%	
Good	3	3	15%		Good	3	1	5%	
Fair	2	0	0%		Fair	2	3	15%	
Unsatisfactory	1	0	0%		Unsatisfactory	1	0	0%	
Statistics				Value	Statistics				Value
Response Ratio				80%	Response Ratio				80%
Mean				4.45	Mean				4.15
Median				5.00	Median				4.50
Standard Deviation				0.76	Standard Deviation				1.09
3. Is accessible outside of class (including after class, office hours, e-mail, etc.)					4. Generates enthusiasm for the subject matter				
									
Options	Score	Count	Percentage		Options	Score	Count	Percentage	
Excellent	5	20	100%		Excellent	5	18	90%	
Very Good	4	0	0%		Very Good	4	1	5%	
Good	3	0	0%		Good	3	1	5%	
Fair	2	0	0%		Fair	2	0	0%	
Unsatisfactory	1	0	0%		Unsatisfactory	1	0	0%	
Statistics				Value	Statistics				Value
Response Ratio				80%	Response Ratio				80%
Mean				5.00	Mean				4.85
Median				5.00	Median				5.00
Standard Deviation				0.00	Standard Deviation				0.49

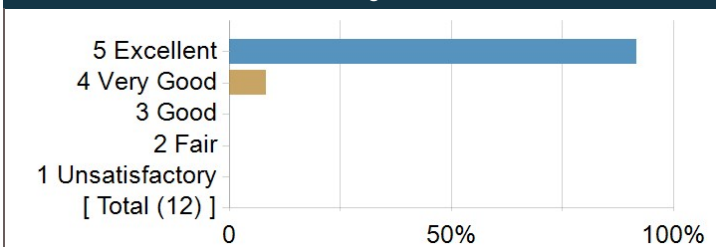


## 5. Facilitates discussion and encourages participation



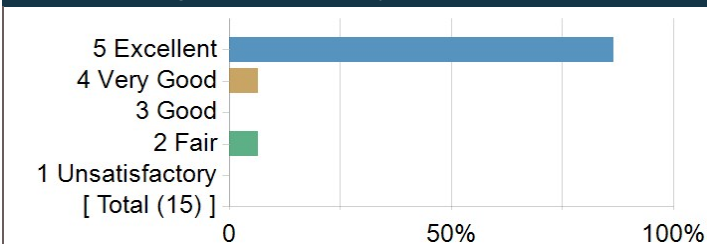
Options	Score	Count	Percentage
Excellent	5	16	84%
Very Good	4	3	16%
Good	3	0	0%
Fair	2	0	0%
Unsatisfactory	1	0	0%
Statistics			Value
Response Ratio			76%
Mean			4.84
Median			5.00
Standard Deviation			0.37

## 6. Gives useful feedback on assignments



Options	Score	Count	Percentage
Excellent	5	11	92%
Very Good	4	1	8%
Good	3	0	0%
Fair	2	0	0%
Unsatisfactory	1	0	0%
Statistics			Value
Response Ratio			48%
Mean			4.92
Median			5.00
Standard Deviation			0.29

## 7. Returns assignments in a timely fashion



Options	Score	Count	Percentage
Excellent	5	13	87%
Very Good	4	1	7%
Good	3	0	0%
Fair	2	1	7%
Unsatisfactory	1	0	0%
Statistics			Value
Response Ratio			60%
Mean			4.73
Median			5.00
Standard Deviation			0.80

## General Course Questions - Comments

**What were the strengths of this course? Please be specific and use concrete examples where possible.**

Comments
The course provided an accessible introduction to differential geometry. The psets were very guided which was helpful in giving you experience and practice with the course material without feeling too lost. I appreciate that the instructor pauses for questions fairly often during the lecture and answer the questions well. It really helped us digest the material better. The recap at the start of the lecture also helped us recall concepts from the previous lecture, which is essential since the material almost always builds upon itself. The accessibility of last year's lectures notes was really helpful, and I am so grateful for them. The de-emphasis on grades and the plentiful extra credit opportunities made learning more fun.
The pacing of the class is fantastic. I thought it covered the perfect amount of material overall. I also liked that we had longer problem sets due every other week rather than shorter ones due each week – it gave me more time to think and work through the problems.
Professor Mondal is the best instructor I had in a math course in my entire life! Absolutely incredible teaching methods. While problem sets are hard, and I had a decent background in proofs with concurrent enrollment in Math 112, Professor Mondal was always supportive of me. I did my best, worked hard, and learned differential geometry, which is the most interesting branch of theoretical math in my opinion.
Puskar really cares about his students! He learned all of our names by the second week. The content picks up in the second half of the semester, and the problem sets are hard but if you go to office hours they're very do-able in the time he allows. He is also very understanding if you need more time on a pset or don't understand a concept. I was afraid to speak in class in the beginning, but he creates a good atmosphere. The exams are super similar to the practice exams, but are a bit long so be speedy! Not a stressful course overall
Puskar was very encouraging and helpful. The best part was that he knew everyone's names by the end of the third class! Questions were encouraged and it was made sure that you understood what was said. I liked the intuition built by using curves in the first half.
Lecturer! Interesting homeworks.
Goes in depth
Fun and kind professor
Personable lecturer, great environment, light workload, low-stress exams.
– The course tries to give real life examples and reasoning for each topic, which is great.
Very accessible professor, entertaining guy
Our class discussions and the frequent asking of questions in lecture were very helpful for learning

**How could this course be improved? Please use concrete examples where possible and provide constructive suggestions.**

Comments
I wish that the motivation behind a lot of the second-half material starting from tensors was more fleshed out, since I could get quite lost in the thick of it; maybe more time spent on the second half would be helpful. Overall, lectures moved quite slowly, maybe a little bit faster would be great. I think future iterations should also provide a latex source for the pscts.
The course notes were not fully updated until the end of the semester, making it impossible to review lecture material via the notes as the semester went along. The midterm and the final were SUPER long – the midterm took 2.5 hours, and the final took 3.5 hours for over 15 students in the class (I counted as I walked out of both tests), which doesn't feel right.
Great course as is! If only, we could know the overall letter grade performance we had in the middle of the semester so we could know how we can adjust coming final exams.
I honestly struggled to follow a lot of the course material and understand how everything was connected.
I think there is a lot of content in the second half of the course. I honestly don't fully understand it (our last class was like 3 combined), and I wish that it had been a bit slower. It could be improved by shorter tests.
While the introduction via curves is useful, I think way too much time is spent on it and the second half of the course is very rushed, where definitions for stuff like tensors, metrics, and tangent spaces feel unmotivated. The course contents could be supplemented with contents from books such as Visual Differential Geometry (Needham) where the intuition for the manifold is built from scratch and instead, most of the focus is on building the intuition for 2D surfaces. I believe the exams as they were given were too easy: they would be difficult if the solutions to most problems weren't already revealed beforehand. I think this made the exams very tedious and regurgitative rather than prompting original thought.
No textbook. Lack of mathematical rigor. Exams were more about copying the notes than they were about understanding of material.
More on cotangent spaces!
Homework that covers what we go over in class, not stuff we didn't have time to get to. More time on the second half of the course
We didn't get through a lot of content; could be helped by being guided more by definitions. Also was generally hard to follow along in lecture, especially towards the end (e.g., defining connections); providing textbook references would be super helpful.
–Better planning: it sometimes felt as if the class was just covering things at random.
Much much much clearer lectures and assignments. Midterm exam felt like a waste of time because so much was copying exactly from practice test. The lectures were hard to follow because he spoke a bit too fast and the notation was not clear or precise (it is impossible to follow math notes if there are little mistakes throughout or discrepancies in notation). This was really frustrating to me. Also questions asked were not clear. And, even though I liked the minimal work, because we never solved a problem for weeks I didn't actually know how to do anything until it was too late. Math classes should have active learning (actively solving problems) because that is how people learn and also that is how teachers can figure out when students are confused before its been months and hope is lost. I think this course needs to be entirely restructured.
Nothing

## Requirements Comments - What did this course require of you?

In your opinion, what preparation or background is necessary to take this course?

Comments
Comfort with proofs and multivariable calculus.
You need to know real analysis, and knowing formal linear algebra is extremely, extremely helpful
Background in linear algebra
Some linear algebra and a basic understanding of differential equations. Physics 15a might also help, even if it's taken concurrently.
calc / lin alg
Formal proof writing and calculus! Also becomes very physics-y
To clarify the difficulty, this is supposed to be a difficult course but the exams were marked liberally, almost to a fault (in my opinion). I don't think any additional background is needed for this course other than multi-variable calculus. Topology would be helpful but it is covered in the course.
Linear algebra and math 25b. I think that an understanding of multivariate real analysis is necessary in order to fill in the gaps where there is a lack of rigor in lecture over the first half of the semester, and math 25b is the only undergraduate course that covers multivariate real analysis. Also, a linear algebra course is assumed prerequisite, preferably a linear algebra course that has talked about rotation groups and isometries and self-adjoint operators.
Linear algebra and multivariable calc. 25b helps a lot
Comfort in vector calculus, linear algebra, and elementary real analysis
background in proofs based math
Linear algebra, multivariate calculus.
solid linear algebra preparation, multivariable calc, some exposure to proofs, some previous knowledge of or introduction to geometry
REVIEW linear algebra and calculus. Says you don't need to but you will be totally lost if you don't
As it says in the syllabus, "the chain rule and common sense"

## Recommendations Comments - Would you recommend this course?

What did you take away from your experience in this course? What did you learn? How did this course change you?

Comments
This class teaches you all about integral curves, manifolds, and the start of tensors and their application to manifolds. You'll gain valuable geometric intuition about manifolds and how to think about notions such as curvature and tangent spaces. The course gave me more confidence in geometry, and is overall a good course to take.
I wish I took more geometry and physics because the material from this course was great.
Great course, encouraging staff, and supporting Professor! Learned differential geometry and actually know how to solve difficult proofs on my own.
I think this class made a lot of multi-variable calculus clear to me since there was now a "reason" to use it.
I learned a ton, especially in the second half of the course! This course helped me keep some positivity regarding the math department. Puskar was a shining light in my day.
I learned quite a lot of geometry and manifold theory. I'll definitely be taking more courses on differential geometry/topology
Learned a bit about manifolds and tangent spaces.
I didn't learn much
I enjoyed seeing how so many intuitive conclusions about geometry translate into rigorous math

What would you like to tell future students about this class? (Your response to this question may be published anonymously.)

Comments
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Comments
<p>This class teaches you all about integral curves, manifolds, and the start of tensors and their application to manifolds. You'll gain valuable geometric intuition about manifolds and how to think about notions such as curvature and tangent spaces. The course gave me more confidence in geometry, and is overall a good course to take.</p> <p>The psets were very guided which was helpful in giving you experience and practice with the course material without feeling too lost. I appreciate that the instructor pauses for questions fairly often during the lecture and answer the questions well. It really helped us digest the material better. The recap at the start of the lecture also helped us recall concepts from the previous lecture, which is essential since the material almost always builds upon itself. The accessibility of last year's lectures notes was really helpful, and I am so grateful for them. The de-emphasis on grades and the plentiful extra credit opportunities made learning more fun.</p> <p>I wish that the motivation behind a lot of the second-half material starting from tensors was more fleshed out, since I could get quite lost in the thick of it; maybe more time spent on the second half would be helpful. Overall, lectures moved quite slowly, maybe a little bit faster would be great. I think future iterations should also provide a latex source for the psets.</p>
<p>Puskar is great – His method of teaching is intuitive rather than formal, and it's clear he's more interested in making sure students understand the material rather than get bogged down in formalities. Pros: Psets are long but every other week, which I strictly prefer over weekly psets; Lectures were always entertaining, and I usually walked out feeling like I truly comprehended the material; Midterm and final are completely based off the practice versions (i.e., 90% or so of the material on the actual exam is word for word from the practice). Cons: Exams are crazy long (2.5 hours from the midterm and 3.5 hours for the final); amount of rigor required when proving something is routinely unclear; psets are on the more challenging side.</p>
<p>Like most of the other geometry courses, this is difficult. I think the hardest part was adapting to the new material, and also trying to find the best way to reinforce what I was learning. If this course is taught again in the future by Puskar, I would recommend taking it if you're able to keep up with a fast pace (especially near the end of the course).</p>
<p>Take the course if it is taught by Professor Mondal. He is a great instructor and super friendly with all the students regardless of their proof background. The topics following the midterm are difficult, so go to office hours, ask questions, and start the problem sets early. It would have been nice to know one's overall letter grade performance halfway through the semester or at least get some guidance on the grading format of the class so students can know how to adjust. Overall, great upper math class!</p>
<p>Dude, take it. It's easy. It's got interesting and broad results that show up in physics and ML. Puskar is a great lecturer and really knows his stuff, and honestly, he has an electric personality in the classroom like nobody else. The homework is straightforward, and the exam content comes straight from course notes, extra credit problems, and practice problems. I took this as a fifth class on top of a pretty brutal course load, and this was a total godsend in terms of time commitment. My only negative comment is that things got pretty abstract towards the end, but the final result was defining distance on an arbitrary surface, so that was pretty cool. It's a great class overall, and I would highly recommend it to anyone interested in math and/or physics.</p>
<p>Puskar clearly cares about our learning. but to be candid i don't think i learned very much in this class; and also the exposition could have been clearer. it felt like we got stuck in molasses on a bunch of pretty basic concepts in what could have been a very rich course. but nonetheless, love Puskar</p>
<p>Puskar is a funny guy and is definitely entertaining to learn from. His lectures were sometimes confusing, but things become much clearer once you get used to his style. Regardless, he is incredibly dedicated to teaching and was always accessible outside of class. He is really generous with his time and often offered 1:1 support to make sure that everyone understood what was going on. He frequently hosted smaller office hours to help answer questions and his weekly office hours were always very helpful in getting through the problem sets. We also only had 4 problem sets throughout the semester which was nice relative to the rest of the math department. Warning though that this is not your standard math class. Things are quite informal and not meant to be very rigorous. The point of the class under Puskar is more so for students to have an intuitive understanding of things rather than to be able to give formal line by line proofs, which I think made this class somewhat more accessible for people with less background, and unusual for those with more. Still, a great way to satisfy the 130s requirement in a low pressure environment.</p>
<p>Puskar really cares about his students! He learned all of our names by the second week. The content picks up in the second half of the semester, and the problem sets are hard but if you go to office hours they're very do-able in the time he allows. He is also very understanding if you need more time on a pset or don't understand a concept. I was afraid to speak in class in the beginning, but he creates a good atmosphere. The exams are super similar to the practice exams, but are a loooooonnggg!! There is a lot of content though. I definitely didn't understand all of it by the end of the class, but there are cool concepts. Depends what you want out of a math class</p>
<p>Puskar is an amazing person and is very encouraging (he knew everyone's names by the end of the third class!) The grading for this course is very chill. However, there are some major issues with the course. Most of the time in the course is spent on simple stuff like curves and dynamical systems which could easily be covered in half the time. The important content of the course like tangent spaces and tensors happened in the last month and is very very rushed and feel very unmotivated. There isn't a lot of "geometry" in this course. If you're interested in the geometric aspects I would highly recommend picking up a copy of Visual Differential Geometry and Forms by Needham.</p>
<p>Take this class! Puskar is the best! He cares so much. I have never met a lecturer who was so easy to meet with. Also, he knows the material extremely well. My main warning is that the problem sets get progressively harder so make sure to start the last one or two close to when they come out since Puskar is a ton of help in office hours.</p>
<p>I have mixed feelings about this class. On the one hand, Puskar is an extremely kind and caring teacher. He really wants the best for all of his students and is more than willing to meet outside of class to make this happen. On the other hand, this course definitely</p>

Comments
feels like a grad school course. It moves really fast and it can be really hard to understand what is going on.
Dr. Mondal is amazing. There's a lot of opportunities to learn the material further so take them
The second half of the course gets way harder very suddenly
With Puskar, you've probably heard the reputation for this being a pretty light workload class. This is true, especially since the exam questions are almost entirely given to you before the exam, and the exam is open-note. To my understanding, for what "differential geometry" is, we didn't get through very much content.
Math 136 is was an interesting class – its challenging but can be applied and understood in different contexts. Puskar does do a good job trying to make these connections evident and use them as starting points through which to teach the material. PSETs and Assignments sometimes felt like they drew from material not included the class. The material after the midterm does start to become considerably more challenging and confusing. I do recommend having a previous introduction to proofs and higher level math before taking this class, which differs from the pre-reqs listed in my.harvard.
Low workload for the first half. No due dates are legit. 4 PSETS. I really liked that this was the lightest workload class because there really isn't any work except for the 4 PSETS, which do take a significant amount of time and need OH. That being said, by the end I was extremely frustrated because I hadn't learned a single thing. So overall I would not recommend.
I enjoyed this class. Puskar is a really fun lecturer, and he keeps it interesting.

## Instructor Comments

Please comment on this person's teaching. (Your response to this question may be published anonymously.)

Comments
Puskar is fantastic and an interesting character. He came to every class wearing capri pants, would often use his surroundings to make a point (e.g., moving desks, bending blinds, tossing chalk, etc), and was really good at answering questions on the fly. It's pretty clear he more interested in students intuitively understanding the material rather than bogging students down in formalities. In general, I really like this approach even if it causes some confusion about the level of rigor he's looking for on the psets and exams.
By far my favorite professor during my time at Harvard!
Make him a full professor, like, yesterday. He really deserves it for how seriously he takes teaching.
He has a bit of an eclectic teaching style, but is so accessible outside of class and a good teacher especially one on one.
Awesome person and teacher! Prioritizes his students and also generates immense enthusiasm in class by being so lively. Lecture almost felt like a math seminar some days with all the participation he fostered.
Puskar in an unconventional but very engaging lecturer and there was never a dull moment in this class. He was always happy to talk through confusing concepts and made me excited about differential geometry.
Puskar, congrats on finishing another semester of math 136! Throughout the semester, you have demonstrated that you are really enthusiastic about the course and the material. Your lectures were usually engaging and taking the time to connect the material to real world examples and heuristics was really helpful and demonstrates effective methods in teaching. There are two areas of growth I would like to mention:
1) Classroom control – It is great that you take the time to answer questions in class and encourage students to engage actively with the material. As the Bok center says: " Effective lecturers—like effective communicators in a range of disciplines, from the theater to politics—are capable of creating a sense among their students that they are engaged in an intimate conversation regardless of the dozens or hundreds of other people around them." Your course is well in the way to this "intimate conversation" feel. However, there were times where students' question would derail the class with questions either on purpose or by chance; this of course leads to losing class time and causes students to become distracted. I would encourage you to maintain the free and open exchange of questions in the class, but better invite students with long questions at the end of class or questions that belong to the TpM space to email you, go to office hours, or stay a few minutes after class.
2) Professionalism – It is great that you try to build rapport with students – your skills in learning every student's name early is impressive and motivates students to participate in class. However, the professor/student relationship is friendly, but still formal, so I would encourage you to strike a balance in this realm. I would encourage you to avoid confronting students in office hours, in front of other students, that they have not completed the PSETs or their performance in the class. Professionalism also includes being prepared and organized. I would encourage you better keep track of mid term dates for example.
You clearly show passion for the material and for teaching, which is not a given instructor's today – thank you! All the best in the next semester!
Not clear lectures, but tries to encourage participation well
Puskar is a great lecturer. He keeps the class fun and interesting.