Teaching Statement

As a lecturer at UC Berkeley starting from Jan, 2019, I have taught courses Math 104 and Math 185, and am assigned with Math 140 for Spring 2020. Before I joined Berkeley, I was a visiting assistant professor at UCI and had been given the opportunity to teach 8 lower-division classes, 5 upper-division classes and 1 research class[1]. I do enjoy teaching and I care about my students. I cherish my teaching experience at Berkeley, UCI and also experience as a teaching assistant during my Ph.D at UW-Madison, which groomed me as I developed from a math student to a math educator.

As a serious mathematician, I have high expectations for my students. To achieve my goals with them, I strive to implement good teaching practices including well-organized lectures, clear explanations, helpful office hours and improving my teaching skills to promote active learning. The following comments from one of my Math 104 students in Spring semester 2019 might be a good illustration of my teaching performance.

> *Prof. Wang was a really clear and prepared lecturer, the homework problems were well chosen, she was always kind and approachable, and her grading scheme was clear and fair. She also posted really detailed and helpful lecture notes and answers student questions really quickly and clearly on Piazza. She's by far the best upper-division math professor I've had at Berkeley and I'd happily recommend her course to a friend.*

In the following of my teaching statement, I shall describe my teaching strengths in detail.

First, **I encourage independent and creative thinking.** A good journey in math always starts from strong curiosity and self-motivation. To motivate them, I usually present interesting applications of the subject and give a broad view of the topic. At the same time, my enthusiasm on the subject is reflected in my speaking and writing throughout the lecture. Students always enjoy discussing their independent thinking with me, both inside and outside the classroom. In my lectures, when I present a statement or a theorem, instead of directly writing down " Theorem ...", I usually give my students the opportunity and time to think what we can expect in a statement or what extra conditions are needed. For example, in a calculus class, instead of simply writing down Green's formula precisely, I invite students to discover 'the simply connected condition' (as explained to them as 'without a hole' condition) from examples by themselves. This way effectively prevents students from mechanically memorizing results without understanding the mathematics. In my upper-division classes, I assign creative final projects, and encourage them to engage group discussions. I also introduce some basic training in looking for references on the internet. For example, in my Ring and Field Theory (Math 120) class, I assigned a final bonus project on the prime ideal domain structure of the Novikov ring, with an introduction to the history and importance of this ring in modern geometry[2].

Second, in my classes **I always provide real-life examples before solid math.** Math is an abstract subject. However, almost every mathematician thinks about math in a visualizable way rather than via pure logical deduction. In my opinion, one is not able to grasp a math concept until he or she could explain it in a way that even ordinary people could get the idea. For example, usually at the beginning of a group theory class, students are not very comfortable with the abstract language. When I introduce the concept of transitivity in an equivalence relation in the first class, I prefer an example like the following before I strictly write down the precise definition, "You know there are two types of relationships among people. One is like between relatives and the other is like between friends. By the first one, if David is related to John and John is related to Tom, then David must be related to Tom too. However, by the second one, David is a friend of John and John is a friend of Tom, but David may not be a friend of Tom! Transitivity is just used to distinguish these two types of relationships. " My students always laugh, but more importantly, they will never have trouble in mastering this concept any more. After students catch the concept, I will then present them with plenty of supporting examples. The following comments from my students indicate my teaching effectiveness in this aspect.

> *She gives us a lot of examples to illustrate a really abstract idea or theorem. She explains the idea really clearly until we understand when we ask her questions; The teacher usually gives us the theorems then EXAMPLES before proceeding with the proof which is very helpful since a lot*

[1] They are Linear Algebra (3A); Multivariable Calculus I (Math 2D); Multivariable Calculus II (Math 2E); Theory of ODEs (Math 118); Group Theory (Math 120A); Ring and Field Theory (Math 120B); Undergraduate Research (Math 199).

[2] available at `https://www.math.berkeley.edu/~ruiwang/pdf/alg2.pdf` P. 49.

> *of the theorems are very abstract so we do not know what we are even trying to prove; She is able to make rather complicated things more concise and understandable. For example, the instructor made the difficult theorems in class easier to understand by carefully explaining it.*
>
> *— Students from Group Theory, Ring and Field Theory and Theory of ODEs*

Third, **I am effective from both inside and outside the classroom.** As a math professor, I deliver every lecture in high quality, which requires good preparation in both content and organization. I prepare my lectures and select homework problems very carefully, so that they cover the key knowledge points of the course. To help students think actively in my lecture instead of busily coping notes, I prepare and post my lecture notes online systematically[3]. I also practice good skills of (black/white-)board writings so that every students in my class can read clearly. These efforts bring me a lot of appreciation from my students and here are some of their comments from various classes (Calculus, Linear Algebra, Group Theory and Ring and Field Theory).

> *She is very knowledgeable. Teaches without any notes in hand or book, which is quite impressive; Professor Rui knows the material really well and she understands the concepts very deeply; She writes very neatly and big enough to see from the back of the classroom; Her logic is very clear. She writes extremely clear lecture notes on the board. It is perfect to tell her lecture is an art of performance; Provides thorough lectures in class accompanied by regularly-updated summary notes that give an overall outline of what was covered, which is exceedingly helpful.*

Outside the lectures, besides regular office hours, I also provide meeting times for those who are not available in my office hours. Students commented that I was "extremely patient and approachable". Starting from this quarter, I created a discussion board from the course website for my Group Theory students. This encourages students to join math discussions, share their mathematical ideas and practice their math expressions.

Fourth, **I construct an interactive teaching environment.** I think the role of an instructor is to guide, not to push. Hence, I always provide a comfortable environment for my students to ask questions in my class. "Don't be shy to ask questions" is always the first advice I give to my students. A student from my Ring and Field Theory wrote such a comment on the evaluation –"The instructor asks if we have questions throughout the lecture and actually WAITS FOR A RESPONSE, unlike other teachers who don't really want people to ask questions."– which exactly reflects my teaching style from this perspective. I never worry that too many questions would slow down the pace of lectures. In my opinion, learning to ask important questions is an essential ability and the best evidence of understanding. Moreover, the quality of questions shows how well students follow the class, which helps me to judge the pace of my class. Opposite to intuition, experience shows that to setup an interactive environment at the beginning of each semester/quarter will NOT slow down the pace but make the teaching much more effective.

> *Whenever there is a confusing concept that is being lectured and explained, she does not hesitate to ask the class if there are questions before proceeding. In addition, when asked about a misunderstanding of a question, she will go back and explain slightly differently and focus a little more time to make sure we grasp the proper definition.*
>
> *— A student from Calculus*

The last but not the least, **I care about every student.** I never consider math as a subject only for very smart people.

> *She is also very willing to take extra time to help students that are struggling with extra office hours and review sessions.*
>
> *— A student from Math 104*

In my opinion everyone who is eager to learn should have an equal opportunity to see the beauty of math. For those who appear to be falling behind, I choose to ask them if they have special difficulty in my

[3]available at `https://www.math.berkeley.edu/~ruiwang/`.

class. I suggest basic topics or skills for them to review. When students feel that they have been cared for, they always would make more effort to catch up. For those who are particularly interested in math and willing to learn more, I am happy to provide extra help to introduce them into the wonderful world of modern mathematics. In the past year, I have been supervising two students in Undergraduate Research (Math 199), in which I guide them to read more advanced books for research and help them to choose research/survey topics.

Since I was a little girl, my dream has always been to become a mathematician. Born to a very ordinary family, this dream couldn't have been realized without a great deal of help from my teachers. Therefore, I deeply understand the importance of being a qualified mentor for students. Especially, after I got the precious opportunity to be able to teach at Berkeley, I have seen so many young students who are working hard and showing their strong willing to understand mathematics. This encourages me to be more dedicated to my job and promoting my own knowledge and teaching skills to become a better educator. I do hope my commitment and dedication could bring my students to the path of seeing the beauty of math, and I am willing to pass down my knowledge and passion for math to every student of mine.

Teaching Material

1. The following are selected lecture notes for the courses I have taught at UC Berkeley and UC Irvine since 2016.

   Math 185 (Complex Analysis) at UC Berkeley: `https://math.berkeley.edu/~ruiwang/pdf/185.pdf`

   Math 104 (Mathematical Analysis) at UC Berkeley: `https://math.berkeley.edu/~ruiwang/pdf/104.pdf`

   Math 2D (Multivariable Calculus) at UC Irvine: `https://math.berkeley.edu/~ruiwang/pdf/2D.pdf`

   Math 120A (Group Theory) at UC Irvine: `https://math.berkeley.edu/~ruiwang/pdf/alg1.pdf`

   Math 120B (Ring and Field Theory) at UC Irvine: `https://math.berkeley.edu/~ruiwang/pdf/alg2.pdf`

   Math 118 (Theory on ODEs) at UC Irvine: `https://math.berkeley.edu/~ruiwang/pdf/ODE.pdf`

   Math 161 (Modern Geometry) at UC Irvine: `https://math.berkeley.edu/~ruiwang/pdf/161.pdf`

2. More course material, such as syllabus, homework and solutions can be found from my webpage `https://math.berkeley.edu/~ruiwang`

Teaching Evaluations

Wang, Rui (MATH 104 LEC 007 INTRO TO ANALYSIS) - Sp 2019 (Instructor Version)

Project Title: **Spring 2019 Evaluations**

Courses Audience: **31**
Responses Received: **13**
Response Ratio: **41.94%**

Subject Details	
Name	MATH 104 LEC 007 INTRO TO ANALYSIS
DEPT_NAME	MATH
DEPT_FORM	MATH
EVALUATION_TYPE	F
First Name	Rui
Last Name	Wang

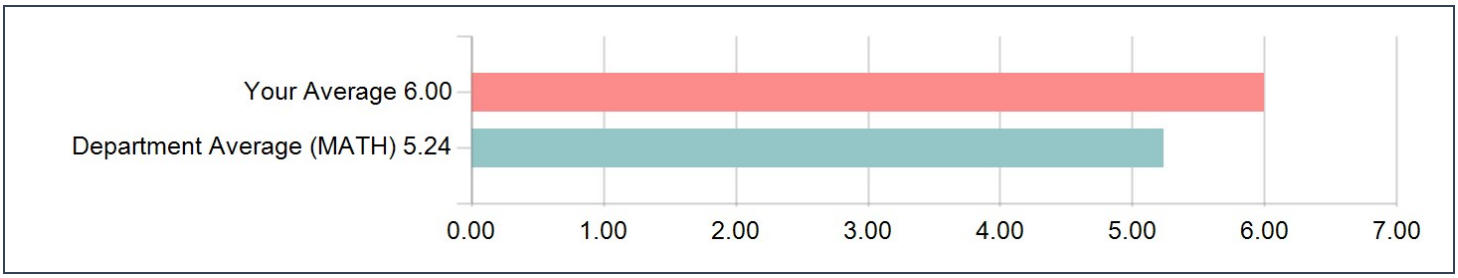
Creation Date: **Wednesday, June 05, 2019**

FOR YOUR INFORMATION: Please note that "Department Average" for each rating question is calculated using all sections in your department. This may include both Faculty and GSIs depending on whether the department has selected a question item to be used for both.

RATING QUESTIONS (QUANTITATIVE)

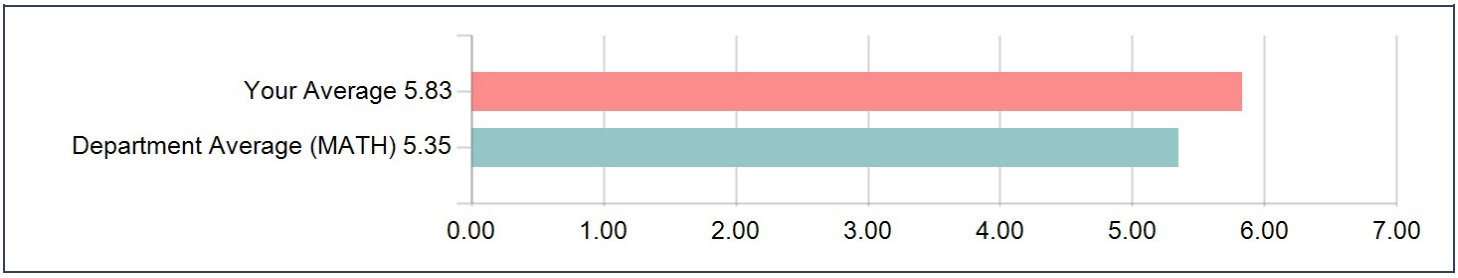
UNIVERSITY WIDE QUESTIONS: The quantitative items in this section are asked across all courses at Berkeley.

Considering both the limitations and possibilities of the subject matter and the course, how would you rate the overall effectiveness of this instructor?



Considering both the limitations and possibilities of the subject matter and the course, how would you rate the overall effectiveness of this instructor?		
Options	Count	Percentage
1-Not at all Effective	0	0.00%
2	0	0.00%
3	0	0.00%
4-Moderately Effective	2	15.38%
5	1	7.69%
6	5	38.46%
7-Extremely Effective	5	38.46%
Statistics		Value
Response Count		13
Mean		6.00
Median		6.00
Standard Deviation		1.08

Considering both the limitations and possibilities of the subject matter and the course, how would you rate the overall effectiveness of this course?

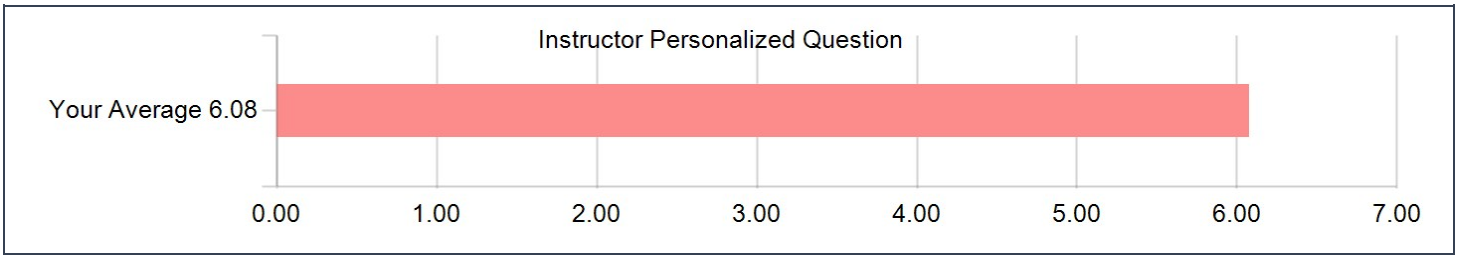


Considering both the limitations and possibilities of the subject matter and the course, how would you rate the overall effectiveness of this course?		
Options	Count	Percentage
1-Not at all Effective	0	0.00%
2	0	0.00%
3	0	0.00%
4-Moderately Effective	2	16.67%
5	1	8.33%
6	6	50.00%
7-Extremely Effective	3	25.00%
Statistics		Value
Response Count		12
Mean		5.83
Median		6.00
Standard Deviation		1.03

DEPARTMENT PROVIDED RATING QUESTIONS: Questions in this section were selected by your department for inclusion on this evaluation.

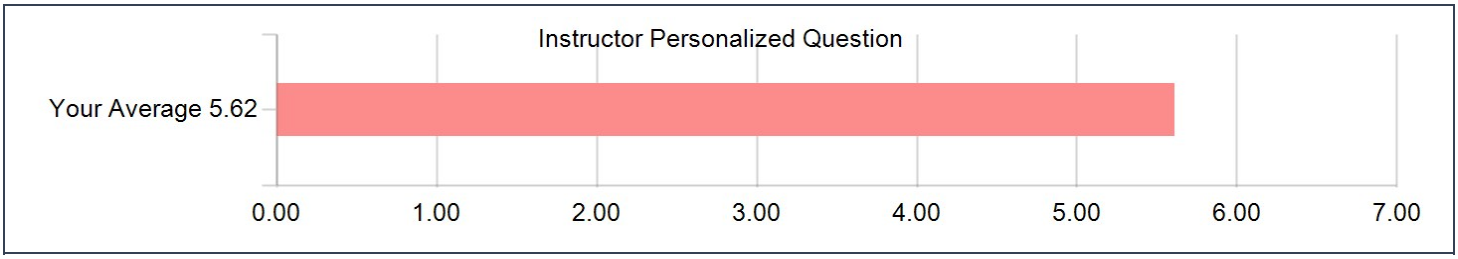
INSTRUCTOR PROVIDED QUESTIONS (CUSTOM): If any rating questions appear in this section, they were created by you. If blank, you did not add any custom items to your evaluation. These are viewable only by you and not accessible by other report viewers in your department.

The course assignments and lectures usefully complemented each other.



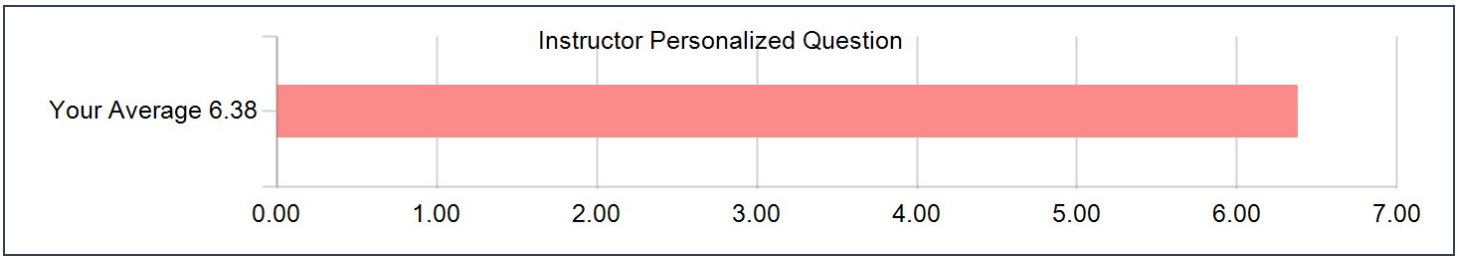
The course assignments and lectures usefully complemented each other.		
Options	Count	Percentage
1-Not at all	0	0.00%
2	0	0.00%
3	0	0.00%
4-Somewhat	2	15.38%
5	1	7.69%
6	4	30.77%
7-Very	6	46.15%
Statistics		Value
Response Count		13
Mean		6.08
Median		6.00
Standard Deviation		1.12

The course was overall organized in a way that helped me learn.



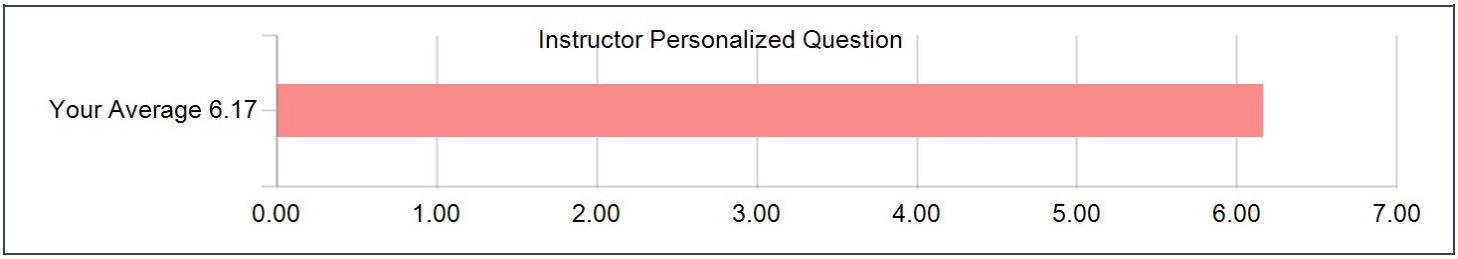
The course was overall organized in a way that helped me learn.		
Options	Count	Percentage
1-Not at all	0	0.00%
2	0	0.00%
3	1	7.69%
4-Somewhat	2	15.38%
5	2	15.38%
6	4	30.77%
7-Very	4	30.77%
Statistics		Value
Response Count		13
Mean		5.62
Median		6.00
Standard Deviation		1.33

The course instructor is accessible and responsive.



The course instructor is accessible and responsive.		
Options	Count	Percentage
1-Not at all	0	0.00%
2	0	0.00%
3	0	0.00%
4-Somewhat	1	7.69%
5	2	15.38%
6	1	7.69%
7-Very	9	69.23%
Statistics		Value
Response Count		13
Mean		6.38
Median		7.00
Standard Deviation		1.04

The instructor increased my understanding of course material.



The instructor increased my understanding of course material.		
Options	Count	Percentage
1-Not at all	0	0.00%
2	0	0.00%
3	0	0.00%
4-Somewhat	2	16.67%
5	0	0.00%
6	4	33.33%
7-Very	6	50.00%
Statistics		Value
Response Count		12
Mean		6.17
Median		6.50
Standard Deviation		1.11

OPEN ENDED QUESTIONS (QUALITATIVE)

DEPARTMENT PROVIDED QUESTIONS: Questions in this section were selected by your department for inclusion on this evaluation.

What are the instructor's strengths? (i.e., preparation and organization of lectures, content, boardwork, examples, clarity, willingness to answer questions, attitude toward students, office hours, homework, exams, grading).

Comments
Prof. Wang was a really clear & prepared lecturer, the homework problems were well chosen, she was always kind and approachable, and her grading scheme was clear & fair. She also posted really detailed and helpful lecture notes and answers student questions really quickly & clearly on Piazza. She's by far the best upper–division math professor I've had at Berkeley and I'd happily recommend her course to a friend.
Very smart and prepared to answer any question on the material.
Preparation and organization of lectures, boardwork, examples, clarity
– Good lecture organisation. Rarely runs out of time or has to rush. – Lectures are clear and concise. – Always willing to answer questions during lecture – Genuinely wants her students to do well and is always willing to help – Good examples and board work is neat – Homeworks are just the right length. Definitely not easy but not too long which is perfect. – Excellent notes – Office hours are always helpful
Good at organization and can answer questions effectively
Instructor is extremely organized in lecture, homework, and lecture notes. Very willing to answer questions and dedicated to her students.
Everything: lectures and boardwork are very clear and at a good pace, questions are answered well, homework is useful, and exams are fair.
Prof. Wang is great :) It is clear that she tries very hard and is always well prepared! lecture notes are great and she always has good examples
She is well organized, on time, has a good attitude towards the students, and she presents the material clearly and at the appropriate level of detail.
Her lectures are very organized, she answers questions, and is very clear in her explanations. She is also very willing to take extra time to help students that are struggling with extra office hours and review sessions.
Attitude towards students, homework schedule, returning work in a timely manner
Lecture pace is great, the instructor's lectures are great for understanding the material (unlike the textbook), homework length is good, midterms are fair

What are the instructor's weaknesses? How could the instructor improve his/her teaching?

Comments
Sometimes just going through the proof of everything isn't the best way to learn. Examples often times offer better insight and can be less confusing than proofs.
Lectures can be better. Her lectures style is not engaging at all.
– Often skips or rushes through the intuition or motivation behind proofs and certain concepts. She definitely attempts at giving an intuition for concepts, but tends to gloss over it. This is likely because it seems obvious to the instructor but is not at all obvious to us. Again, this is not her fault. Spending more time going a little slower when discussing the motivations behind an idea will be hugely beneficial. Often, this can make all the difference between understanding and not understanding a certain concept. – Most lectures are on the faster side. This is not necessarily the instructors fault as she has to cover a certain amount of material. – Professor could provide some more resources for exam preparation. Her review sessions are good, but maybe she could give a list of practice problems to do before each exam, either from the book or her own problems.
Goes through material very quickly (but this may be due to the breadth of topics that need to be taught in this course). Further, homework sometimes pertained to material that had not been taught in lecture before which was very difficult.
The only weakness I can think about is that the material is not well–motivated at times, and builds on concepts not clearly discussed yet. Although in themselves the results and their proofs are presented clearly, the ordering can be changed. For instance, discussion of the properties of the exponential function can be postponed to until after uniform continuity has been covered.
Teaching, homework amount
Some concepts are fairly abstract, so slowing down there might be a little helpful
She knows a lot of stuff and we don't have the same understanding of Math so it would be helpful that at least one problem from each concept is solved with detail.

Comments on any other relevant aspects of the course such as content, text, how it could be improved, advice to people who have to take it, etc.

Comments
I would have preferred using the ross text book. Rudin is an extremely dense book and is known to be rather difficult. All my friends used ross and it seemed to be a better book in terms of being able to understand at our level.
Rudin's book is awesome
This course desperately needs more contact time with instructors. A professor cannot reasonably be expected to have more than two hours of office hours a week as she does already. Likewise, the GSI has many office hours. However, these are unstructured and are mostly for clarifying concepts and homework problems. Actual structured discussion sections with a GSI who reviews the week's material and goes over practice problems in class, like in lower division courses would be incredibly beneficial. While I understand that learning is expected to be more independent in upper division courses, the material is difficult and discussion sections are designed specifically to familiarise conceptually challenging material. Math 104 most definitely needs a discussion section.
Read the book before the lectures and ask a lot of questions
It would be helpful if lectures prepared us more to do the homework questions. It often felt like there was a gap between the theorems we learned in lecture and the problem solving techniques required in homework.
I like that Rudin is used.
I enjoyed this course and think any serious STEM student should take it. I think a small discussion of the distinction of different properties of the objects studied in the course and where they come from can be helpful at the beginning of the course; i.e. properties of injective/surjective maps from set theory, algebraic properties of R as an ordered field, and topological properties of Euclidean spaces can be separately discussed and compared.
Please dont' use Rudin – it is an encyclopedia of theorems and did not help my understanding at all. I learned everything when the instructor explained them in lecture.

Your Major? (List All)

Comments
Microbial Biology, Applied Mathematics
Physics
Mathematics, Computer Science, Data Science
Intended: Physics and (Applied Mathematics or Computer Science)
Computer Science, Economics
Computer science
EECS
computer science, statistics
EECS, Applied Mathematics
Math and computer science
Applied Math, Data Science, and Sociology
EECS
Applied Mathematics

INSTRUCTOR PROVIDED QUESTIONS (CUSTOM): If any open-ended questions appear in this section, they were created by you. If blank, you did not add any custom items to your evaluation. These are viewable only by you and not accessible by other report viewers in your department.

On average, how many hours per week have you spent on this course, including attending classes, doing readings, reviewing notes, writing papers, and any other course-related work?

Comments
8
8
about 15–20 hours a week.
20
10–15
6
15
17
16
4 hours
8
25

How satisfied were you with your effort in this course?

Comments
Very unsatisfied
Pretty satisfied
I spend most of my time on this course so I'd say I'm fairly satisfied with the time I'm putting into the course.
If I had more time I would have done more in this course.
fairly satisfied
Very satisfied
I could have spent my time more efficiently, although I am not unsatisfied with my effort.
very
Not very, sometimes I felt like I was trying hard but with little to no results
Somewhat