

SAN JOSÉ STATE UNIVERSITY  
DEPARTMENT OF MATHEMATICS AND STATISTICS

Fall 2019

**Math 231B: Functional Analysis**

**Instructor:** Slobodan Simić

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**Website:** <http://www.sjsu.edu/people/slobodan.simic/courses/Math-231B/>

**Required text:** Lokenath Debnath and Piotr Mikusiński, *Introduction to Hilbert Spaces with Applications*, third edition, Elsevier/Academic Press, 2005

**Non-required text:** Brian Hall, *Quantum Theory for Mathematicians*, Springer GTM 267, 2013

**Prerequisite:** Math 231A (with a grade of "C–" or better) **or** *instructor consent*.

**Office hours:** Mondays and Wednesdays 9:45–10:30 AM and 2:00–2:45 PM (in my office), by appointment, and almost any time on Piazza (see below).

**Homework:** There will be regular homework assignments (about 10) mostly based on the textbook. I will grade three problems from each set but will provide solutions to most problems. It is important that you attempt to solve *every* homework exercise. You will be able to revise and rewrite your solutions based on my initial comments and suggestions.

**Exams:** None.

**Expository paper:** Each student will be required to write an expository survey paper on a topic of his or her choice related to the course. Papers need to be typeset in L<sup>A</sup>T<sub>E</sub>X. For more information, see the class web site.

**Presentation:** Each student will be required to present her/his expository paper at the end of the semester. Presentations will be 10–15 minutes long with a few minutes for questions.

**Grading policy:** Homework 50%, Paper 40%, Presentation 10%

**Course outline:** About two thirds of the semester will be dedicated to the classical theory of Hilbert spaces (Chapters 1, 3, and 4). (The material of Chapter 2 should have been covered in Math 231A.) The remaining third of the semester we will focus on applications to integral equations (sections 5.1–5.5 and 5.11) and quantum mechanics (parts of Chapter 7, time permitting). For quantum mechanics I will also use Hall's book; I will provide the relevant chapters. No prior knowledge of physics is expected. See the class web page for more details.

**Main goals:** The main goal of the course is to acquire a solid understanding of the basic properties of Hilbert spaces and linear operators between them, with applications.

**Participation:** During class please feel free to stop me at any time and ask questions. I encourage and greatly appreciate students' participation.

**Piazza:** To handle questions posed outside of class, we will be using Piazza (<https://piazza.com>), a free platform for instructors and GSIs to efficiently manage out-of-class Q&A. On the class dashboard, students can post questions and collaborate Wikipedia-style to edit responses to these questions. Instructors can also answer questions, endorse student answers, and edit or delete any posted content. **Instead of emailing me math questions, I encourage you to post them to Piazza.** Each student will be invited to join Piazza by email. Please join it as soon as you can, as I plan to use Piazza extensively.

Instead of sending me email, please create a post on Piazza with your question or concern. Private or anonymous post are fine, though they should be used rarely.

**Feedback:** I appreciate constructive feedback which you can give me in person, by email, or via Piazza.

**Course Content Learning Outcomes:** Upon successful completion of this course, students will be able to:

- (LO1) Compute the norm of a linear operator between Hilbert spaces.
- (LO2) Find solutions to basic integral equations.
- (LO3) Compute the Fourier transform of certain functions and use it to solve basic differential equations.

**Academic integrity:** From the Office of Student Conduct and Ethical Development: Your own commitment to learning, as evidenced by your enrollment at San José State University, and the University's Academic Integrity Policy, require you to be honest in all your academic course work. Faculty are required to report all infractions to the Office of Student Conduct and Ethical Development. The policy on academic integrity can be found at [http://sa.sjsu.edu/student\\_conduct](http://sa.sjsu.edu/student_conduct).

**Campus policy in compliance with the Americans with Disabilities Act:** If you need course adaptations or accommodations because of a disability, or if you need special arrangements in case the building must be evacuated, please make an appointment with your instructors as soon as possible, or see them during office hours. Presidential Directive 97-03 requires that students with disabilities register with DRC to establish a record of their disability.

**Class attendance:** According to University policy F69-24, Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.

**Course requirements:** SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at <http://www.sjsu.edu/senate/docs/S12-3.pdf>.

For more details, see the course web page.