MATH 4810/5810 Hilbert Spaces
Course Projects

August 2025

Course Instructor: Dr. Markus Pflaum

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1. L^p-spaces (Sam, Aug 8, 10:40am)
2. The Theorem of Stone–Weierstraß (Harman, Aug 11, 9:20am)
3. The Stern–Gerlach experiment (Maddox, Aug 19, 9:40am)
4. The experiments by Alain Aspect et al. which confirmed Bohr's interpretation of quantum mechanics
5. Representations of the Lie algebra $\mathfrak{su}(2,\mathbb{C})$ (Bryn, Aug 19, 11:00am)
6. Coherent states (Cooper, Aug 19, 11:20am)
7. Wigner's theorem
8. Bargmann's theorem
9. The EPR paradox and Bell's inequality
10. Quantum Logic from a mathematical point of view (Percy, Aug 20, 9:40am)
11. Pauli's derivation of the spectrum of the hydrogen atom (Marissa, Aug 19, 9:20am)
12. Fourier analysis in Hilbert spaces: Fourier series and the Legendre polynomials
13. Orthogonal polynomials: Laguerre and Hermite polynomials (Nourah, Aug 19, 9:00am)
14. Vibrations of a (circular) membrane (with outlook to the problem whether one can hear the shape of a drum)
15. The spin in quantum mechanics (Adan, Aug 19, 10:00am)
16. Clifford algebras and spin geometry (Sam Schw., Aug 19, 10:40am)
17. The Dirac Operator (Jeremy, Aug 19, 10:20am)
18. The Born–Oppenheimer approximation
19. The geometric phase in quantum mechanics (Megan, Aug 20, 11:00am)
20. Quantum entanglement (Salma, Aug 20, 10:00am)
21. Quantum Error Correction on Infinite-Dimensional Hilbert Spaces (Jazzy, Aug 20, 10:40am)
22. Foundations of Quantum Computing (Akhil, Aug 20, 10:20am)
23. The Weyl-Moyal product and deformation quantization (Kerem, Aug 20, 11:20am)
24. Quantum transistors and quantum interference
25. Computation and visualization of quantum mechanical operators with python (Matthew, Aug 20, 9:20am)
26. Computation of eigenvalues, eigenstates, and time evolution of states of a quantum mechanical particle in a double or triple well potential with python or MATLAB (Christian, Aug 20, 9:00am)