

MATH 480/872

Harmonic Analysis & Quantum Theory

2026-2027
T2

Instructor:

Dr. Artur Sowa
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Course Details

MATH 480 CRN 32902
MATH 872 CRN 32903

Schedule:

Term 2
Times TBD

Tentative Topics:

- Harmonic analysis in Euclidean spaces and on groups
- Haar and Walsh bases, and applications to qubit and fermion physics
- Dirichlet series, and applications to boson physics

Course Objective:

This course has two primary goals. The first is to help students understand the significance of non-standard computational paradigms, with particular emphasis on quantum computation. This will be accomplished through the study of information-theoretic perspectives viewed through the lens of quantum theory. The second goal is to address existing gaps in the mathematics and mathematical physics curriculum by presenting foundational material in harmonic analysis.

Students Who May Be Interested:

Undergraduate students in: Pure and Applied Mathematics, Physics and Engineering Physics, Computer Science

Graduate students in: Pure and Applied Mathematics, Physics and Engineering Physics, Computer Science, Computer Engineering

Other Information:

The course is intended for an interdisciplinary audience, including graduate and senior undergraduate students from Mathematics, Physics, Computer Science, and Computer Engineering. Students interested in the evolving landscape of information theory and cryptography beyond standard computational frameworks may find the course especially motivating.

The main topics are motivated by the growing relevance of harmonic analysis to modern applied mathematics, quantum information, and emerging computational paradigms. The material is research-informed and draws in part on recent developments arising from collaborations with mathematicians and physicists in quantum theory and mathematical physics.
