Usman Adil

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Education

Ludwig-Maximilians-Universität München — Munich, Germany
Masters in Physics — *Oct. 2022 - Present*

Lahore University of Management Sciences — Lahore, Pakistan
Bachelor of Science in Physics — *Sep. 2017 - Jun. 2021*
CGPA: 3.47
Physics GPA: 3.61

Professional Experience

Maqsad Pvt. Ltd. — Karachi, Pakistan
Academic Graduate — *Nov. 2021 - Apr. 2022*
Writing and producing animated academic video lectures for high school physics for the mobile app "Maqsad".

Undergraduate Research Experience

Quantum Fields in Curved Spacetime (Undergraduate Thesis) — *Jun 2020 - May 2021*
I encountered the dynamics of a quantum field in the Friedmann Robertson Walker Metric especially in the case of the universe's de Sitter expansion. I also used the existence of horizons for an accelerating observer in flat spacetime to derive the Unruh effect, and use that analogy to obtain Hawking radiation for an eternal black hole.

Courses taken during Masters

Advanced Quantum Mechanics (Viatcheslav Mukhanov) — *Winter 2022/2023*

Quantum Optics 1 (Immanuel Bloch) — *Winter 2022/2023*

Advanced Particle Physics (Otmar Biebel) — *Summer 2023*

Quantum Optics 2 (Immanuel Bloch) — *Summer 2023*

2D Semiconductors (Anvar Baimuratov) — *Summer 2023*

Graduate Level Courses Taken In Undergraduate

Cosmology and Black Holes (A-) — *Fall 2020*

Introduction to Quantum Field Theory (A-) — *Spring 2020*

General Relativity (A-) — *Spring 2020*

Computational Physics (A) — *Spring 2020*

Spectra of Differential Operators and Quantum Graphs (A-) — *Fall 2019*

Undergraduate Course Projects

Anisotropic Cosmology — *Fall 2020*
PHY 644 - Cosmology and Black Holes
Introduced anisotropy in the FRW metric by using different scale factors for each of the three spatial dimensions and study the expansion of the universe. Obtained the Friedmann Equation including contribution from shear components.

Feynman Diagrams of Light-by-Light Interaction using QED *Spring 2020*
PHY 539 - Introduction of Quantum Field Theory
Cross section of the probability amplitude of four vertex photon-photon scattering under the Quantum Electrodynamics Hamiltonian.

Impedance spectroscopy of a graphite-electrode-paper-dielectric capacitor *Fall 2019*
PHY 300 - Experimental Physics Lab II
Produced capacitors by drawing graphite electrodes on either side of paper and performed impedance spectroscopy and plotted Bode Curves.

Period Bifurcations in non-linear RLC circuits *Fall 2019*
PHY 300 - Experimental Physics Lab II
Studied the non-linear dynamics in an RLC circuit. Obtained Phase Portraits, Poincare Sections and Bifurcation Diagrams.

Track Spacing on a DVD *Fall 2019*
PHY 300 - Experimental Physics Lab II
By shining a laser and measuring the discrete diffraction patterns obtained, I obtained the microscopic spacing between the tracks of a DVD.

Chess in C++ using object oriented programming *Fall 2018*
CS 200 - Introduction to Programming
Wrote the C++ code for the game-play logic of a console based multiplayer chess game.

Hotel Management System in C++ *Fall 2017*
CS 100 - Computational Problem Solving
Co-authored a hotel management system in C++ including its own database in a text file.

Teaching Experience

Teaching Assistant for PHY 104 (Modern Physics) *Spring 2021*
20 hours per week. I was responsible for conducting tutorials, grading assignments and holding regular office hours to answer student queries.

Teaching Assistant for PHY 101 (Mechanics) *Fall 2019*
See above.

Extra Curricular Activities

Founding Member of Salam Sessions *Fall 2019*
Academic talks and lectures on the intersection of Maths and Physics. Served as part of the management committee and photographer.

Society of Photo-Optical Instrumentation Engineers (LUMS Chapter) *Fall 2019 - Spring 2020*
Took part in the society's stall in the *Lahore Science Mela* and presented various optics demonstrations to school children. Served as the main photographer; produced images used to advertisement posters.

LUMS Media Arts Society *Fall 2018 - Spring 2019*
Assistant Director to "Experimental Narratives" Project in the society. Assisted in various filming.

Programming Languages

C++, Python, Matlab, Mathematica