

PHYS 450

What is taught in this course will depend in part on the interests and backgrounds of the students. The intent is to give students a good grounding in analytic, numerical and mixed analytic/numeric techniques of mathematical physics. Likely topics include:

Group Theory

- Finite/Infinite discrete Groups and infinite/continuous (Lie) Groups.

 - Group representations and examples

 - Application of group theory to evaluation of integrals, matrix elements, and other parts of physics

 - Product representations, Wigner-Eckhart Theorem and applications, possibly Clebsch-Gordan coefficients and applications.

Asymptotic analysis

- Asymptotic analysis of sums, integrals and ordinary differential and difference equations

 - Analysis of an integral representation of a special function as an example of an asymptotic expansion

 - Use of complex analysis to improve analytic and numeric calculations of sums and integrals

 - The principle of asymptotic balance, boundary layer theory, asymptotic matching, global asymptotic analysis

 - Analysis of asymptotic series, including Pade approximants, two-point Pade's, Borel resummation.

 - Finding accurate approximations to complex functions / integrals simply so they can be evaluated quickly in numerically in "inner loops"

 - Multiple time scale analysis

Numerical Techniques for partial differential equations

Transform techniques

- Fast Fourier Transforms and applications

 - Convergence of various transform methods for representing functions

 - Transform techniques in partial differential equations