

## PHYS 449

**Syllabus:** 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:

Solution techniques for Ordinary Differential Equations

Complex Variables, analytic functions, and Integration

Analytic functions, simple and complicated partial fractions

Deforming analytic and numerical integrals in the complex plane to evaluate them or make them easier to approximate (analytically or numerically)

Integration

Various techniques for calculating integrals, including moment generating functions

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

Transform techniques

Fourier Transforms, fast fourier transforms and applications

Convergence of various transform methods for representing functions

Transform techniques in partial differential equations

Group Theory?