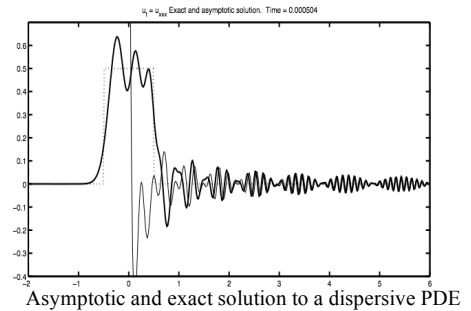# Methods of Applied Mathematics

Fall 2020, **MATH-GA 2701**
Mondays, 1:25-3:15, room 512 WWH*.
Instructor: Oliver Bühler, room 1013 WWH
obuhler@cims.nyu.edu

Asymptotic and exact solution to a dispersive PDE

TA & recitations: TBA

*Blended instruction course for Fall 2020. Will start fully online via zoom & recorded lectures.

A graduate course for PhD and Master students interested in pursuing research in Applied Mathematics.

Prerequisites: linear algebra, ODE, ideally PDE as well.

Textbook: MH Holmes, *Introduction to Perturbation Methods,* Springer, 2nd edition 2013. Free download from NYU via SpringerLink
https://www.springer.com/us/book/9781461454762

Grading: this course will be graded as a regular course with a grade based on approximately nine homework sets.

Syllabus:

Dimensional analysis, scaling, similarity solutions. Regular and singular perturbations, asymptotic expansions.

Method of multiple scales for ODEs, averaging, WKB solution, Kapitza's pendulum.

Matched asymptotic expansions, boundary layers, matching rules.

Fourier methods for PDEs, stationary phase method, group velocity, dispersive waves.

Geometric wave theory, eikonal and transport equation, inhomogeneous media, ray tracing for dispersive waves, caustics.

Green's functions, near-field, far-field, and multipole expansions.