Models in Applied Mathematics

ESAM D-21-2

Winter 1998

Hermann Riecke

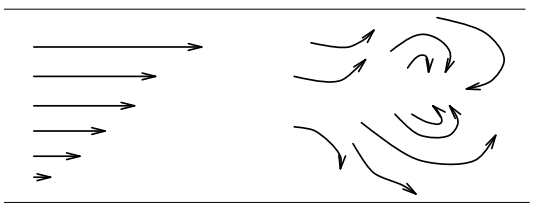
Time and Place: TuTh 2:30-4:00

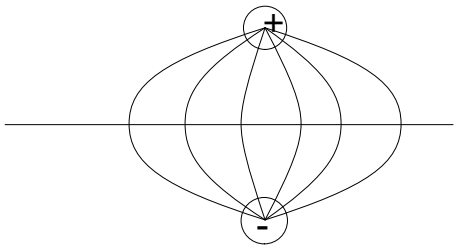
In this class an introduction will be given into two areas of science/engineering in which partial differential equations play a central role: fluid mechanics, electromagnetism.

A major focus of the class will be the **motivation and derivation** of the fundamental equations (Navier-Stokes, Maxwell, ...). Therefore the experimental facts and mathematical assumptions used for the derivation will be stressed.
In addition, the mathematical methods required to solve the equations will be presented. This will be done using concrete examples.

Topics to be discussed include:

• Fluid Dynamics:
Conservation laws, derivation of Navier-Stokes, stress tensor, potential flow, parallel flows, hydrodynamic stability.
• Electromagnetism:
electro/magneto statics, vector potential, Coulomb's law, Biot-Savart law, derivation of Maxwell's equations, waves.





Recommended books:
C.C. Lin and L.A. Segel, *Mathematics applied to deterministic problems in the natural sciences*
L.A. Segel, *Mathematics applied to continuum mechanics.*
Note: the material of D-21-1 is useful but **not** required for D-21-2.

Do you have any questions?
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