MATH 6041: TOPICS IN DIFFERENTIAL EQUATION
BOUNDARY VALUE PROBLEM IN KINETIC THEORY - COURSE SYLLABUS

I. Contact information:

- Instructor: Hongxu Chen.
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- Office hour: by appointment

II. Course information:

- Course day and time: Tu 9:30 - 12:15
- Course room: 219, LSB
- Grading: attendance and final report

III. Course schedule:

- Basic introduction of Boltzmann theory and boundary value problem. [10]
- Well-posedness and decay theory of dynamical Boltzmann equation, $L^2 - L^\infty$ framework. [12]
- Well-posedness and dynamical stability of the steady Boltzmann equation. [8]
- Regularity theory of Boltzmann equation. [13, 7]
- Well-posedness theory of Vlasov-Poisson-Boltzmann system. [4]
- Boltzmann theory under specular reflection and generalized diffuse reflection. [15, 5, 6]
- (Optional) Some hydrodynamic limit of Boltzmann equation, $L^6 - L^\infty$ framework. [9, 16, 3]
- (Optional) Well-posedness theory of Landau equation. [11]
- (Optional) Boundary layer equation. [2, 14, 1]

References

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[2] N. Bernhoff and F. Golse, *On the boundary layer equations with phase transition in the kinetic theory of gases*, Archive for Rational Mechanics and Analysis, 240 (2021), pp. 51–98.

[3] R. E. Caflisch, *The fluid dynamic limit of the nonlinear boltzmann equation*, Communications on Pure and Applied Mathematics, 33 (1980), pp. 651–666.

[4] Y. Cao, C. Kim, and D. Lee, *Global Strong Solutions of the Vlasov–Poisson–Boltzmann System in Bounded Domains*, Archive for Rational Mechanics and Analysis, (2019), pp. 1–104.

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[12] ———, *Decay and continuity of the Boltzmann equation in bounded domains*, Archive for rational mechanics and analysis, 197 (2010), pp. 713–809.

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[15] C. Kim and D. Lee, *The Boltzmann equation with specular boundary condition in convex domains*, Communications on Pure and Applied Mathematics, 71 (2018), pp. 411–504.

[16] L. Saint-Raymond, *Hydrodynamic limits of the Boltzmann equation*, no. 1971, Springer Science & Business Media, 2009.