Analysis of Partial Differential Equations

Summer Graduate School, July 29-August 9, 2024, Okinawa

Reading List – Course 1: Measure-theoretical analysis, divergence-measure fields, and nonlinear PDEs of divergence form.

1. Gui-Qiang G. Chen and Monica Torres (2021): Divergence-Measure Fields: Gauss-Green Formulas and Normal Traces. Notices of the American Mathematical Society, 68 (2021), no. 8, 1282–1290.

2. Lawrence L. Evans and Ronald F. Gariepy (1992): Measure Theory and Fine Properties of Functions. *Studies in Advanced Mathematics*. CRC Press: Boca Raton, FL, 1992.

3. Enrico Giusti (1984): Minimal Surfaces and Functions of Bounded Variation, Monographs in Mathematics, 80, 1984, Boston.

4. Francesco Maggi (2012): Sets of Finite Perimeter and Geometric Variational Problems: An Introduction to Geometric Measure Theory, Cambridge Studies in Advanced Mathematics, 135, 2012, Cambridge.

5. Luigi Ambrosio, Nicola Fusco, and Diego Pallara (2000): Functions of Bounded Variation and Free Discontinuity Problems. Oxford Mathematical Monographs. The Clarendon Press, Oxford University Press: New York.

6. Vladimir Maz'ya (2011): Sobolev Spaces with Applications to Elliptic Partial Differential Equations. Springer-Verlag: Berlin-Heidelberg.

7. William P. Ziemer (2017) , Modern Real Analysis, Second Edition, Graduate Texts in Mathematics, Volume 278, Springer, 2017 (with contributions by Monica Torres).

8. Lawrence L. Evans: Partial Differential Equations, Second edition. Graduate Studies in Mathematics, 19. American Mathematical Society, Providence, RI, 2010. xxii+749 pp.

9. Washek F. Pfeffer (2012): The Divergence Theorem and Sets of Finite Perimeter, Chapman & Hall/CRC: Boca Raton, FL.

10. Constantine M. Dafermos (2016): Hyperbolic Conservation Laws in Continuum Physics, 4th Ed., *Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences],* 325, Springer-Verlag: Berlin, 2016.

11. Herbert Federer: Geometric Measure Theory. Springer-Verlag New York Inc.: New York, 1969.

12. Gui-Qiang G. Chen and Monica Torres (2024): Lecture Notes (*to be available for the summer school*).

Reading List - Course 2: Perron's method and Wiener-type criteria in the potential theory of elliptic and parabolic PDEs

1. U.G. Abdulla, Wiener's Criterion at ∞ for the Heat Equation, Advances in Differential Equations, 13(5-6), (2008), 457-488.
2. U.G. Abdulla, Wiener's Criterion for the Unique Solvability of the Dirichlet Problem in Arbitrary Open Sets with Non-Compact Boundaries, Nonlinear Analysis, 67(2), (2007), 563-578.
3. U.G. Abdulla, Regularity of ∞ for Elliptic Equations with Measurable Coefficients and Its Consequences, Discrete and Continuous Dynamical Systems - Series A (DCDS-A), 32, 10(2012), 3379-3397.
4. U.G. Abdulla, Removability of the Logarithmic Singularity for the Elliptic PDEs with Measurable Coefficients and its Consequences, Calculus of Variations and Partial Differential Equations, 57, (6), (2018), 57-157.
5. U.G. Abdulla, First Boundary Value Problem for the Diffusion Equation. I. Iterated Logarithm Test for the Boundary Regularity and Solvability, SIAM J. Math. Anal., 34(6), (2003), 1422–1434.
6. D.H. Armitage and S.J. Gardiner, Classical Potential Theory, Springer Monographs in Mathematics, Springer, 2001.
7. H. Bauer, Harmonische Raume und ihre Potentialtheorie, Lecture Notes in mathematics, Springer, 1966.
8. M.Brelot, Lectures on Potential Theory, Tata Institute of Fundamental Research, Bombay, 1967.
9. J.L. Doob, Classical Potential Theory and its Probabilistic Counterpart, Springer, 1984.
10. L.C. Evans and R.F. Gariepy, Wiener's criterion for the heat equation, Arch. Ration. Mech. Anal., 78, 1982, 293-314.
11. L.C. Evans, Partial Differential Equations, AMS, 2nd edition, 2010.
12. L.L. Helms, Potential Theory, Universitext, Springer, 2009.
13. E. Lanconelli, Sul problema di Dirichlet per l'equazione del cslore, Ann. Math. Pura Appl., 97, 1973, 83-114.
14. I.G. Petrowsky, Zur Ersten Randwertaufgabe der Warmeleitungsgleichung, Composito Math., 1, 1935, 383-419.
15. N. A. Watson, Introduction to Heat Potential Theory, Mathematical Surveys and Monographs, vol. 182, Amer. Math. Soc., Providence RI, 2012.
16. N. Wiener, Certain notions in potential theory, J. Math. Phys., 3, 1924, 24-51.
17. N. Wiener, The Dirichlet problem, J. Math. Phys., 3, 1924, 127-146.