The Department of Mathematics

2024–25–A term

Course Name Integral Transforms and Partial Dffierential Equations

Course Number 201.1.0291

Course web page
https://math.bgu.ac.il//en/teaching/fall2025/courses/introduction-to-partial-dif

Lecturer Prof. Arkady Poliakovsky, <poliakov@bgu.ac.il>, Office 314

Office Hours https://math.bgu.ac.il/en/teaching/hours

Abstract

Requirements and grading[1]

Course topics

.1 The Fourier transform: convolutions, the inversion formula, Plancherel's theorem, Hermite functions, tempered distributions. The Poisson summation formula. The Fourier transform in R^n.

.2 The Laplace transform. Connections with convolutions and the Fourier transform. Laguerre polynomials. Applications to ODE's. Uniqueness, Lerch's theorem.

.3 Classfiication of the second order PDE: elliptic, hyperbolic and parabolic equations, examples of Laplace, Wave and Heat equations.

.4 Elliptic equations: Laplace and Poisson equations, Dirichlet and Neumann boundary value problems, Poisson kernel, Green's functions, properties of harmonic functions, Maximum principle

.5 Analytical methods for resolving partial dffierential equations: Sturm-Liouville problem and the method of separation of variables for bounded domains, applications for Laplace, Wave and Heat equations including non-homogenous problems. Applications of Fourier and Laplace transforms for resolving problems in unbounded domains.

---

[1]Information may change during the first two weeks of the term. Please consult the webpage for updates

Bibliography

.1 Stein E. and Shakarchi R., Fourier analysis, Princeton University Press, .2003

.2 Korner T.W., Fourier analysis, Cambridge University Press, .1988

.3 Katznelson Y., An Introduction to Harmonic Analysis, Dover publications.
.4 John, Partial dffierential equations, Reprint of the fourth edition. Applied
Mathematical Sciences, .1 Springer-Verlag, New York, .1991

.4 Evans Lawrence C. Partial Dffierential Equations, Second Edition.

.5 Gilbarg D.; Trudinger N. S. Elliptic partial dffierential equations of second
order, Reprint of the 1998 edition. Classics in Mathematics. Springer-Ver
lag, Berlin, .2001

.6 Zauderer E. Partial dffierential equations of applied mathematics, Second
edition. Pure and Applied Mathematics (New York). A Wiley-Interscience
Publication. John Wiley & Sons, Inc., New York, .1989 xvi+891 pp. ISBN:
.0-471-61298-7