2026 Korea University International Summer Campus (KU ISC)

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June 27, 2026 – July 24, 2026

ISC509 – Partial Differential Equations with Applications

I. Instructor

Professor	:	Alexander Yarin
E-mail	:	ayarin@uic.edu
Home Institution	:	University of Illinois at Chicago
Class Time	:	9:00am – 11:30am (KST)
Office Hours	:	13:00-15:00pm
Class Format	:	Online Only
Academic Field	:	Engineering, Science

II. Textbook

Required Textbook	:	
Recommended Additional Readings	:	1. G. Arfken, Mathematical Methods for Physicists, 3rd Edition, Academic Press, 1985. 2. M. D. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Prentice Hall, 1998 3. V.I. Smirnov. Course of Higher Mathematics. Plenum Press, 1964. 4. H. Lamb. Hydrodynamics, Dover (any edition). 5. P. Henrici, Applied and Computational Complex Analysis, Volumes 1-3, Wiley, 1986. 6. G. Polya, G. Latta, Complex Variables, John Wiley & Wiley, New York, 1974. 7. N.I.Muskhelishvili, Some Basic Problems of the Mathematical Theory of Elasticity. Noordhoff International Publishing, Leyden, 1975. 8. A.H. England, Complex Variable Methods in Elasticity. John Wiley & Sons, Nework, 1971. 9. L.A. Galin and G.M.L. Gladwell, Contact Problems, Springer, Berlin, 2008. 10. W. R. Smythe, Static and Dynamic Electricity, 3rd ed. McGraw-Hill, New York, 1968.

III. Course Description and Objectives (1 course = 3 credits)

A Partial Differential Equations (PDEs) course introduces analytical techniques to solve equations modeling physical phenomena, such as heat flow, wave propagation, and electromagnetism. Key topics include classification of linear/nonlinear PDEs, method of characteristics, separation of variables, Fourier series, and Green's functions, focusing on parabolic, elliptic, and hyperbolic equations

IV. Grading

Final Exam	:	60%
Assignments	:	20%
Participation	:	20%

V. Class Outline

Date	Topic	Chapter	Remarks
June 27 (Sat)	**Orientation Day (No class)**		
June 29 (Mon)	Conductive heat transfer equation. Boundary and initial conditions. Coordinate systems		
June 30 (Tue)	Classification of the linear PDEs of the second order. Dirichlet and Neumann problems, boundary conditions of the 3rd and 4th kind		
July 1 (Wed)	Simple one-dimensional steady-state and transient problems		
July 2 (Thu)	Fourier method: separation of variables		
July 6 (Mon)	Sturm–Liouville theory (regular and singular): eigenfunctions and eigenvalues. Discrete and continuous spectra. Orthogonality		
July 7 (Tue)	Examples of solutions of the heat conduction equation. Linearity and superposition		
July 8 (Wed)	Bessel equations and the related functions		
July 9 (Thu)	Fourier-Bessel series		
July 13 (Mon)	Examples of solutions of the heat transfer equation for cylindrical cases		
July 14 (Tue)	Legendre polynomials		
July 15 (Wed)	Examples for spherical cases		
July 16 (Thu)	Special methods for non-homogeneous problems. Convergence improvement		
July 20 (Mon)	Problems with continuous spectrum. Fourier and Fourier-Bessel integrals		
July 21 (Tue)	Nonlinear problems with heat release. Thermal explosion		
July 22 (Wed)	Laplace transform. Mellin's inverse formula		
July 23 (Thu)	**Final Exam**		
July 24 (Fri)	Last day of 4-week program		