Math 514 Syllabus (092)
Dr. K. M. Furati
Updated May 29

Course Title: Advanced Mathematical Methods

Textbooks: (Kr) Principles of Applied Mathematics, James P. Keener, 2000.

(DuT) Transform Methods for Solving PDEs, D. G. Duffy, 2nd Ed, 2004.

Additional Reading: (DuA) Advanced Engineering Mathematics with Matlab, D. G. Duffy, 2n Ed, 2003.

(D&B) Integral Transforms and Their Applications, L. Debnath and D. Bhatta, 2n Ed, 2007.

Course Description: Integral transforms; Fourier, Laplace, Hankel and Mellin transforms and their applications. Singular integral equations. Wiener Hopf technique. Applications of conformal mapping. Introduction to asymptotic expansions.

Wk	Date	Topic	Main Components	Textbooks		Read	
				Kr	DuT	DuA	D&B
1	Feb 20 – 24	Complex Variables Preliminaries	numbers, functions, differentiation, integration	6	1.4	1	x
2	Feb 27 – Mar 03						
3	Mar 06 – 10						
4	Mar 13 – 17	Conformal Transforms	bilinear transforms, applications				
5	Mar 20 – 24	Fourier Transform	properties, delta function, convolution, inversion, applications	x	1.1, 3.1 – 3.4	5	2
6	Mar 27 – 31						
7	Apr 03 – 07	Laplace Transform	properties, convolution, inversion, applications	7.3.1	1.2, 2.1 –	6	3 & 4
8	Apr 10 – 14	Mellin Transform	properties and applications	7.3.2	x	x	8
	Apr 17 – 21	Break					
9	Apr 24 – 28	Hankel Transform	properties and applications	7.3.3	3.5	x	7
10	May 01 – 05	Wiener-Hopf Method	W-H equation, Fourier transform in complex plan, function factorization	x	7	x	x
11	May 08 – 12		BVP with Mixed BC				
12	May 15 – 19		Singular integral equations.				
13	May 22 – 26	Asymptotic Expansions	Order notation and relations, asymptotic equivalence, sequences, and series	10.1			
14	May 29 – Jun 02		Integration by parts method	10.2			
			Laplace's method	10.3			
15	Jun 05 – 08		Method of steepest descent	10.4			
			Method of stationary phase	10.5			