Mathematics 241–Syllabus and Core Problems

Math 241. Calculus, Part IV. Staff. Prerequisite(s): MATH 240.

Sturm-Liouville problems, orthogonal functions, Fourier series, and partial differential equations including solutions of the wave, heat and Laplace equations, Fourier transforms. Introduction to complex analysis. Use of symbolic manipulation and graphics software.

Text: Zill, Dennis and Cullen, Michael *Advanced Engineering Mathematics, 3rd Edition*

Fourier Series and Partial Differential Equations

	Core Problems (M)=Maple
Chapter 12 Orthogonal Functions and Fourier Series	
12.1 Orthogonal Functions 653	5, 10, 11, 13, 17, 21
12.2 Fourier Series 658	1, 5, 7, 13, 17
12.3 Fourier Cosine and Sine Series 663	5,8,13,23,25,29,35,39,43(M)
12.4 Complex Fourier Series 670	2, 5, 10
12.5 Sturm-Liouville Problem 674	1, 5, 7, 11
12.6 Bessel and Legendre Series 681	1, 4, 7, 15, 19
12.6.1 Fourier-Bessel Series 682	
12.6.2 Fourier-Legendre Series 685	
Chapter 13 Boundary-Value Problems in Rectangular Coordinates	
13.1 Separable Partial Differential Equations 690	1, 2, 8, 19, 28
13.2 Classical Equations and Boundary-Value Problems 694	1, 2, 5, 7, 8, 11
13.3 Heat Equation 699	1, 4, 5
13.4 Wave Equation 702	1, 3, 7, 11
13.5 Laplace's Equation 707	2, 7, 11, 16, 17
Chapter 14 Boundary-Value Problems in Other Coordinate Systems	
14.1 Problems in Polar Coordinates 729	1, 4, 5, 11
14.2 Problems in Polar Coordinates and Cylindrical Coordinates: Bessel Functions 734	1, 5, 9, 14(M)
Chapter 15 Integral Transform Method	
15.3 Fourier Integral 755	1, 4, 5, 10, 17
15.4 Fourier Transforms 760	1, 2, 8, 16

Complex Analysis

	Core Problems (M)=Maple
Chapter 17 Functions of a Complex Variable	
17.1 Complex Numbers 797	1, 5, 15, 23, 27, 33, 37, 39
17.2 Powers and Roots 801	5, 9, 15, 17, 23, 30, 33, 39
17.3 Sets in the Complex Plane 805	1, 4, 7, 10, 16, 17, 25
17.4 Functions of a Complex Variable 808	2, 7, 17, 20, 26, 29, 35, 43
17.5 Cauchy-Riemann Equations 814	1, 3, 7, 10, 11, 16, 17, 25
17.6 Exponential and Logarithmic Functions 819	5,11,14,21,25,32,37,41,43,47
17.7 Trigonometric and Hyperbolic Functions 825	1, 10, 13, 16, 19, 22, 29
17.8 Inverse Trigonometric and Hyperbolic Functions 829	1, 10, 13
Chapter 18 Integration in the Complex Plane	
18.1 Contour Integrals 834	1, 5, 10, 13, 14, 24, 29
18.2 Cauchy-Goursat Theorem 839	1, 7, 9, 13, 19, 21, 23
18.3 Independence of Path 844	1, 4, 14, 19, 23
18.4 Cauchy's Integral Formulas 850	1, 5, 10, 11, 17, 23
Chapter 19 Series and Residues	
19.1 Sequences and Series 858	4, 5, 10, 13, 19, 23, 29
19.2 Taylor Series 863	4, 10, 13, 17, 22, 27
19.3 Laurent Series 869	4, 7, 11, 13, 17, 22, 25
19.4 Zeros and Poles 877	1, 5, 7, 9, 13, 21
19.5 Residues and Residue Theorem 880	4, 5, 15, 17, 22, 29, 31
19.6 Evaluation of Real Integrals 886	2, 7, 8, 14, 26, 31, 35