Course: MATH 2F05
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Topics to be covered

Chapter 1: Simple ordinary differential equations of the first order, geometric solution, separable and scale independent equations, linear equations, variation of parameters, Bernoulli equation, exact equations, orthogonal trajectories.

Chapter 2: Ordinary differential equations of higher orders (mainly second), linear versus nonlinear, equations reducible to first order, homogeneous equations with constant coefficients, characteristic polynomial, initial conditions versus boundary-value problem, differential operators, Cauchy (Euler) equation, linear independence of solutions, nonhomogeneous equations, general and particular solutions, Wronskian, some special cases of RHS, variation of parameters.

Chapters 6, 7 and 3: Matrix operations (addition, multiplication, transpose, inverse), system of (ordinary) linear equations, eigenvalues and eigenvectors, system of differential equations.

Chapter 4: Power series method, recurrence relation, Legendre polynomials, associated Legendre functions, extended power series (Frobenius) method, Bessel functions (first and second kind), Chebyshev, Laguerre and Hermite polynomials.

Chapter 8: Linear algebra of vectors, linear independence, dot and cross product. Scalar and vector fields, curves, their parametric representation, length, tangent and curvature, chain rule, gradient, divergence and curl, polar and spherical coordinates.

Chapter 9: Line integrals (scalar and vector type), double integrals, change of variable, Jacobian, Green's theorem, surfaces, area, surface integrals (scalar and vector type), triple integrals, divergence (Gauss) theorem, Stokes theorem, path-independent line integrals.

Chapter 12: Complex numbers, functions of a complex variable, differentiation, analytic functions.

Chapter 13,14 and 15: Line integrals in complex plane, path independence, Cauchy integral formula, higher derivatives, contour integration.

Textbook: **Erwin Kreyszig, ADVANCED ENGINEERING MATHEMATICS**

Marking Scheme:

Assignments (weekly)	**- 20%**	**(late penalty: 50%)**
Two Midterms	**- 12% each**	
Progress Exam	**- 26%**	
Final Exam	**- 30%**	