*DEPARTMENT OF MATHEMATICS*

April 28, 2004

**Syllabus for MATH422 Section**

**Textbook** Advanced Calculus with Applications

**Author** Hildebrand **Publisher:** Prentice-Hall **Edition:** 2

## Syllabus

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| **Week 1** | Multivariable Calculus<br>6.1 - 6.4 Elementary Properties of Vectors, Scalar ,Vector & Multiple Products |
| **Week 2** | 6.5 - Differentiation of vectors<br>6.6 - Geometry of a Space Curve<br>6.7- The Gradient Vector |
| **Week 3** | 6.8-6.9 - Div, Curl, Laplacian, differentiation formulas<br>6.10 - Line Integrals<br>6.11 - The Potential Function |
| **Week4** | 6.12 - Surface Integrals<br>6.13 - Interpretation of Divergence. The Divergence Theorem<br>6.14 - Green's Theorem |
| **Week 5** | 6.15 - Interpretation of Curl. Laplace's Equation<br>6.16 - Stoke's Theorem |
| **Week 6** | Ordinary Differential Equations - Review of Elementary Theory<br>1.1–1.2 - Introduction, Linear Dependence<br>1.3 - Complete Solutions of Linear Equations |
| **Week 7** | 1.4 Linear Differential Equation of First Order<br>1.5 Linear Differential Equation with Constant Coefficients<br>1.8 Simultaneous Linear Differential Equations |
| **Week 8** | Series Solutions: Philosophy and basic strategy of power series solutions, Singular points, Frobenius, logarithms.<br>Draw from 4.1–4.8, 4.12–4.14 |
| **Week 9** | Laplace Transforms. 2.1 - An Introductory Example. 2.2 - Definition and Existence of Laplace Transforms. 2.3 - Properties of Laplace Transforms.<br>2.4 - The Inverse Transform. |
| **Week 10** | 2.5 - The Convolution, 2.6 - Singularity Functions<br>2.7 - Use of Table of Transforms<br>2.8 - Applications to Linear Differential Equations with Constant Coefficients |
| **Week 11** | Fourier Series 5.1 - Introduction. 5.2 - The Rotating String. 5.3 - The Rotating Shaft<br>5.4 - Buckling of Long Columns Under Axial Loads<br>5.10 - Fourier Sine Series and Cosine Series. |
| **Week 12** | 5.11 - Complete Fourier Series.<br>5.12 - Term-by-Term Differentiation of Fourier Series<br>5.15 - The Fourier Integral. |
| **Week13** | Applications (subject to choice of instructor)<br>e.g. Analog and digital filtering & convolution.<br>Image processing and deconvolution |
| **Week 14** | Introduction of Partial Differential Equations. 9.1 - Introduction. 9.2 - Heat Flow<br>9.10 - The Heat Flow Equation. Heat Flow in a Rod<br>9.14 - Examples of the Use of Fourier Integrals |
| **Week 15** | |
| **Week 16** | |