UNIVERSITY OF CALGARY

DEPARTMENT OF MATHEMATICS AND STATISTICS

Proposed Calendar Description:

First order Partial Differential Equations, Sturm - Liouville Systems, Fourier Series, Double Fourier Series, Fourier Integrals, and Application to Boundary Value Problems in Bounded and Unbounded Domains, Bessel Function with Applications.

Proposed Prerequisite(s):

One of Mathematics 375, Applied Mathematics 307, or Applied Mathematics 311, and One of Mathematics 331, 353, 367, 381, or Applied Mathematics 309.

Proposed Syllabus Description:

Topics	Number of Hours
Introduction:	**4**

Definitions, Mathematical Modeling with Partial Differential Equations, Classification of the General Linear Second Order Partial Differential Equations, General Solution to a Linear Second Order Partial Differential Equation with Constant Coefficients, Other Techniques for Solving Boundary Value Problem of Mathematical Physics, the Superposition Principle.

First Order "Quasi-Linear" Partial Differential Equations: **3**

General and Particular Solutions to a First Order Partial Differential Equation.

Sturm -Liouville Systems: **4**

Definitions; Regular, Periodic and Singular Sturm - Liouville Systems, Eigenvalues and Eigenfunctions, Mean Square Convergence, Orthogonal Expansion.

Fourier Series of a periodic Function: **4**

Periodic functions and their properties, Periodic Extension, Even and Odd Periodic Extensions, Fourier Series of a Function of Period P, Fourier Cosine and Sine series.

A Criterion for the convergence of Fourier Series: **2**

Definitions of Smooth and Piecewise Smooth Functions on a Finite Interval, Dirichlet Theorem (No Proofs), Examples Involving Convergence of Fourier Series, Fourier Cosine and Sine Series Both in the entire Real Line and on in a Finite Interval.

Boundary Value Problems of Mathematical Physics: 8

The Method of the Separation of Variables, The One dimensional Heat Equation, the Two Dimensional Potential Equation in Cartesian and Polar Coordinate Systems, the One Dimensional Wave Equation, D'Alembert Solution to Wave Equation, Applications to Graphing the Displacement of a Vibrating String.

Double Fourier Series with Applications: 4

The Double Fourier Series, The Double Fourier Cosine and Sine Series, Applications to Two Dimensional Heat and Wave Equations, and Three Dimensional Potential Equation.

Fourier Integrals with Applications: 4

Fourier Integral Theorem (No Proofs), Fourier Cosine and Sine Integrals, The Error and Complementary Error Functions, Applications to Boundary Value Problems of Mathematical Physics in Unbounded Domains, Computing Improper Integral Prominent in Applied Mathematics

Bessel Functions with Applications: 3

Bessel and Transformed Bessel Differential Equation, Bessel Functions of the First and Second Kind, Fourier-Bessel Series, Applications to Boundary Value Problems of Mathematical Physics.

Total 36 Hours