Course Outline for Mathematics 406 (3 credits) Term 1, Sept.-Dec., 2014
Variational and Approximate Methods in Applied Mathematics

Prerequisites: MATH 400 and one of MATH 307, CPSC 302
Credit: 3 Credits. Math M406 is credit excluded with M401 and M405.
Instructor: Anthony Peirce, **Office:** Mathematics Building 108
Home Page: http://www.math.ubc.ca/~peirce
Office Hours: Mon: 5-6 pm, Wed: 3-3:55 pm, Fri: 1-1:55 pm
Assessment: The final grades will be based on homework (45%) (including MATLAB projects), an in-class midterm exam (15%) and a final exam (40%).
Assignments are to be submitted in hard-copy from at the designated class – no late assignments can be accepted. There will be no make-up midterms.

Test Date: Wednesday November 5th.

Topics	Lectures
Introduction to numerical methods: Interpolation and Integration	6
Variational and Green's function methods for ordinary differential equations including an introduction to finite element methods	12
Initial value problems for ordinary differential equations: explicit and implicit one step methods, multi-step methods, convergence	6
Green's functions for elliptic equations: finite difference, finite element and boundary element formulations for Laplace's equation	6
Evolution equations: parabolic and hyperbolic equations, the method of lines, Lax's Convergence theory, von Neumann Stability analysis.	5
Test	1
Total	36

Useful Texts:

1. Burden and Faires, Numerical Analysis, 9 th Edition, Brooks Cole; 9 Ed (2010).
2. Zauderer, Partial Differential Equations of Applied Math., Wiley-Interscience, 3 Ed. (2006).
3. Stakgold and Holst, Green's functions and Boundary value problems, Wiley, 3 Ed. (2011).
4. Crouch, S.L. and Starfield, A.M., Boundary Element Methods in Solid Mechanics, George Allen and Unwin, London, 1983.
5. Courant and Hilbert: Methods of Math. Physics Vol. 1 & 2.
6. Hildebrand, Methods of Applied Mathematics, Dover Books on Math., 1992.