

Course Outline for Mathematics 406 (3 credits) Term 1, Sept.-Dec., 2017
Variational and Approximate Methods in Applied Mathematics

Prerequisites: One of MATH 307, CPSC 302 and either MATH 400 or 80% in M256, M257, or M316
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: Monday: 10-11 am, Wed: 3-3:55 pm, Fri: 10-11 am
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 15th.

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, 9th Edition, Brooks Cole; 9th Ed (2010).
2. Zauderer, Partial Differential Equations of Applied Math., Wiley-Interscience, 3rd Ed. (2006).
3. Stakgold and Holst, Green's functions and Boundary value problems, Wiley, 3rd 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.