

# MATHEMATICS 120

## INTRODUCTION TO OPTIMIZATION

**Text:** *An Introduction to Optimization, 2<sup>nd</sup> edition*, by E.K.P. Chong and S. Zak.

Classical nonlinear optimization: Unconstrained and constrained problems in several variables, Jacobian and Lagrangian methods, Kuhn-Tucker conditions. Linear programming, the simplex method, duality, applications. – One quarter of multivariable calculus is a prerequisite for this course, and a linear algebra course is a prerequisite or corequisite.

TOPICS	SUGGESTED NO. OF WEEKS
Topics from multivariable calculus and linear algebra.....2 (§§ 3.1-3.5, 4.1-4.5, 5.2-5.5)	
Linear transformations, eigenvalues and eigenvectors, quadratic forms, algebraic characterization of line segments and hyperplanes, convexity, polyherdal sets, the derivative matrix of a vector valued transformation of several variables, level sets and gradients, multivariable Taylor polynomials.	
Nonlinear optimization.....1 <sup>1/2</sup> (§§ 6.1-6.2, 19.1-19.6, 20.1-20.2)	
Second order conditions for unconstrained relative extrema, regional constraints, equality constraints and Lagrange multipliers, inequality constraints and the Kuhn-Tucker conditions.	
Introduction to linear programming.....2 (§§ 15.1-15.8)	
Elementary examples and applications, geometric interpretation, standard forms of linear programming problems, basic solutions and their properties.	
The Simplex Method and duality.....3 (§§ 16.1-16.7, 17.1-17.2)	
Review of Gauss-Jordan elimination, the Simplex Algorithm and its computational form (with proofs), variants of the Simplex Method, the dual of a linear programming problem and properties of dual programming problems.	