**School of Mathematics**

**Course 221 — Real and Complex Analysis** 1999-00
(SF Mathematics, SF Theoretical Physics, SF Two-subject Moderatorship with Economics & JS Two-subject Moderatorship )

**Lecturer:** Prof. D.J. Simms

**Requirements/prerequisites:** 121

**Duration:** 24 weeks

**Number of lectures per week:** 3

**Assessment:** Some assignments, which do not contribute to the final grade

**End-of-year Examination:** One 3-hour end of year examination

**Description:** Introduction to measures. Definition of Lebesgue integral on the real line. General integration, monotone and dominated convergence theorems, Fubini's Theorem.

Derivative as a linear operator for functions between finite dimensional real vector spaces, partial derivatives in $\mathbf{R^n}$, chain rule, equality of mixed partials, criterion for differentiability. tangent space, differentials, push-forward, pull-back,

Inverse function theorem, $C^n$ functions, coordinate systems and partial derivatives, manifold, implicit function theorem, differentials and vector fields, Lagrange multipliers, exterior derivative, closed and exact forms, line integral, change of variable in multiple integral, integration of forms.

Functions of a complex variable, differentiability, contour integration. Cauchy's integral formula, Taylor and Laurent series, conformal property, zeros and poles, residues, evaluation of integrals, analytic continuation, maximum modulus principle.

May 6, 1999