Guest Speaker: Liviu Nicolaescu  
University of Notre Dame

**Date:** Monday, October 7, 2019  
**Time:** 4:00 PM  
**Location:** 117 Hayes-Healy Hall

**Lecture Title:**  
The probabilistic nature of the Gauss-Bonnet formula

**Abstract**  
Take a smooth compact oriented surface $S \subset \mathbb{R}^3$. A unit vector $N \in \mathbb{R}^3$ defines a linear function $L_N$ that restricts to a smooth function on $S$. Given an open subset $D \subset S$, we denote by $\mu(N, D)$ the signed number of critical points of $L_N$ on $D$. Now let the unit vector $N$ vary along the unit sphere and ask yourself: what is the average/mean value of the function $N \mapsto \mu(N, D)$. Surprisingly, this mean value is given by the the integral over $D$ of the Gaussian curvature of $M$. The Gauss-Bonnet formula is then a special case since for $D = S$, the function $N \mapsto \mu(N, S)$ is constant, equal to $\chi(S)$. Is this a freak low dimensional accident, or there is more to it? In my talk I hope to convince you that there is much more to it, and probability can add a bit more precision to the venerable Gauss-Bonnet theorem.