**Title**: Groebner Bases and Their Applications

**Abstract**: One of the most important theorems in commutative algebra is the Hilbert Basis Theorem, which says that every ideal $I$ in a polynomial ring $R$ (with any finite number of variables) over a field $k$ is finitely generated. In other words, there exist finitely many polynomials $f_1, f_2, \ldots, f_n$ in $I$ such that any polynomial $f$ in $I$ can be written as a linear combination of $f_1, f_2, \ldots, f_n$ (with polynomial coefficients). This basis need not be unique, and in this talk, we will discuss a special type of basis called a Groebner basis, which simplifies many computations in the polynomial ring $R$, and hence in related objects such as algebraic varieties and algebraic groups.