Title: Iwasawa theory, projective modules, and modular representations

Abstract: This talk will be about modules $X$ over a group ring $\mathbb{Z}_p[\Delta]$, where $\mathbb{Z}_p$ denotes the $p$-adic integers and $\Delta$ is a finite group. Such modules occur naturally in Iwasawa theory and sometimes they turn out to be projective modules over $\mathbb{Z}_p[\Delta]$. One can then apply modular representation theory to obtain some interesting and nontrivial relationships between various invariants studied in Iwasawa theory. Our main application concerns an elliptic curve $E$ defined over a number field $F$. The group $\Delta$ will be the Galois group of a finite, Galois extension $K$ of $F$. The module $X$ and the invariants that we study are related to the Selmer group for $E$ over certain Galois extensions of $F$ containing $K$. 