

**A HOMOLOGICAL APPROACH TO  
DETERMINING IWASAWA MODULES UP TO ISOMORPHISM**

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ABSTRACT. For a fixed distinguished polynomial  $f(T) \in \mathbb{Z}_p[[T]]$  we consider the problem of determining the isomorphism classes of finitely generated  $\mathbb{Z}_p[[T]]$ -modules with characteristic polynomial  $f(T)$ . This reduces to determining the submodules of a free  $\mathbb{Z}_p$ -module with additional structure imposed by the action of  $T$ , making it possible to use linear algebra to generate examples. After discussing a few results for low degree  $f$ , we consider the approach of A.V. Yakovlev, which replaces the module  $M$  with a sequence of finite abelian  $p$ -groups connected by homomorphisms. As an application, we will determine the Galois module structure of the group of principal units in an extension of local fields of  $p$ -power degree.