# INVARIANT SUBSPACES VERSUS SUBMODULES


## Abstract

Let $V$ be a finite dimensional vector space over a field $K$ and let $f$ be an endomorphism of $V$. The vector space $V$ can be viewed as a module over the polynomial ring $K[t]$ with a scalar multiplication induced by the endomorphism $f$. Conversely, each module over the polynomial ring $K[t]$ is a vector space over the field $K$ with the module structure induced by a given $K$-endomorphism of $V$. In this setting, a subspace of $V$ is $f$-invariant if and only if it is a submodule of the associated polynomial module.. Hence the two areas in algebra, namely the invariant subspaces and submodules over polynomial rings, are closely related. Living in both areas has the advantages that results and methods of one area can be applied and adapted to derive and obtain results and methods in the other one. In this talk we illustrate these advantages by examples. We discuss special classes of invariant subspaces and submodules, e.g. hyperinvariant subspaces or characteristic submodules, and we indicate topics of current research.