Let \( k \) be an algebraically closed field, let \( \Lambda \) be a finite dimensional \( k \)-algebra and let \( V \) be a \( \Lambda \)-module whose stable endomorphism ring isomorphic to \( k \). If \( \Lambda \) is self-injective, then \( V \) has a universal deformation ring \( R(\Lambda, V) \), which is a complete local commutative Noetherian \( k \)-algebra with residue field \( k \). Moreover, if \( \Lambda \) is further a Frobenius \( k \)-algebra, then \( R(\Lambda, V) \) is stable under syzygies. We use these facts to determine the universal deformation rings of string \( \Lambda_N \)-modules with stable endomorphism ring isomorphic to \( k \), and which lie in a connected component of the stable Auslander-Reiten quiver of \( \Lambda_N \) containing a module with endomorphism ring isomorphic to \( k \). Here \( N \geq 1 \) and \( \Lambda_N \) is a self-injective special biserial \( k \)-algebra whose Hochschild cohomology ring is a finitely generated \( k \)-algebra as proved by N. Snashall and R. Taillefer. This is a joint-work with Yohny Calderon-Henao, Hernan Giraldo and Ricardo Rueda-Robayo.