School of Mathematical and Statistical Sciences
Arizona State University

M E M O R A N D U M

DATE: March 21, 2022

TO: Faculty and Students

FROM: Professor(s) Nancy Childress
Chair/Co-Chairs of Spencer Carey Cvitanov
Defense for the PhD in Mathematics
Committee Members Florian Sprung
John Jones
John Spielberg
Susanna Fishel

DEFENSE ANNOUNCEMENT

Candidate: Spencer Carey Cvitanov

Defense Date: 04/15/2022

Defense Time: 11:00 AM

Virtual Meeting Link: https://asu.zoom.us/j/7958254767

Title: Classifying Self-Adjoint Iwasawa Modules

Please share this information with colleagues and other students, especially those studying in similar fields. Faculty and students are encouraged to attend. The defending candidate will give a 40 minute talk, after which the committee members will ask questions. There may be time for questions from those in attendance. But, guests are primarily invited to attend as observers and will be excused when the committee begins its deliberations or if the committee wishes to question the candidate privately.

ABSTRACT
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Abstract

In the field of Iwasawa Theory, one works with finitely generated torsion $\mathbb{Z}_p[[T]]$ modules, and understanding their structure is a natural question. Furthermore, one may be interested in a more general setting, i.e when F is a finite extension of $\mathbb{Q}_p$, $\mathfrak{O}$ is the integer ring of F, and we are dealing with $\mathfrak{O}[[T]] = \Lambda$ modules. The classification of these Λ modules began in 1997 with Sumida [3], when he became interested in an answer to Greenberg's conjecture. Sumida's paper introduced the following set of Λ modules,

$$M_{f(t)} = \{M | \text{ char(M)=f(T) and M has no non-trivial finite submodules } \}.$$

Here, $f(T)$ is distinguished polynomial over $\mathfrak{O}[T]$. Since then, several other researchers have attempted to classify the isomorphism classes of these sets for various $f(T)$, where the degree of the polynomial and the distance between the roots can vary.

Related to the classification idea is the adjoint problem, introduced by Koike in 1999 [4]. The adjoint of a module M, (denoted $\alpha(M)$) is a mysterious object in Iwasawa Theory, hence the application of knowing their classification is not fully annotated in modern research. There is however, material from Washington [10], that can reveal situations where understanding the adjoint of a module in the set $M_{f(T)}$ can be advantageous. As the adjoint of a module is not well understood, it is easier to classify the "self-adjoint modules" of $M_{f(T)}$ instead, i.e when $M \cong \alpha(M)$. The goal of this dissertation is to improve the classification of self-adjoint modules in the case where the characteristic polynomial has degree higher than 2.