# HONOURS SEMINAR

## Alexander Nau

## The Left Regular Representation of $\mathbb{C}G$

*Supervised by Allen Herman*

**December 20, 2018**
**10:00AM**
**Mathematics and Statistics Lounge, CW307.20**


**Abstract:**

A $C^\star$-algebra is a complex algebra endowed with an involution, a norm that has the $C^\star$ condition, and it is also a complete metric space with respect to this norm. Then $\mathcal{B}(\mathcal{H})$, the set of linear and bounded operators on a Hilbert space $\mathcal{H}$ is a $C^\star$-algebra with respect to the operator norm. And the (finite) group algebra $\mathbb{C}G := \{\sum_{i=1}^{n} a_i g_i \mid g_i \in G,\ a_i \in \mathbb{C}\}$ for a finite group $G$ and $\mathbb{C}$ the complex numbers is a $C^\star$-algebra by defining a faithful representation $\pi_\lambda$ from $\mathbb{C}G$ to $\mathcal{B}(\ell_2(G))$, where $\ell_2(G) := \{f \mid f : G \to \mathbb{C}\}$.

In this talk I will give a more specific definition of a $C^\star$-algebra; I will talk a bit more about the $C^\star$ structure of $\mathcal{B}(\ell_2(G))$; and finally, I will define the left regular representation $\pi_\lambda$ of $\mathbb{C}G$ and explain why $\pi_\lambda$ makes $\mathbb{C}G$ a $C^\star$-algebra.


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