

## ACKNOWLEDGEMENT

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UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the  $x^w m\theta k^w \acute{e}y\acute{e}m$  (Musqueam) people.

## COURSE INFORMATION

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Course Title	Course Number	Webpage	Credit Value
Quantum Theory	MATH 512	Through Canvas	3

First day of teaching: Wed Sep 09; Last day of teaching: Monday Dec 07.

University closed: Sep 30, Oct 12 and Nov 11; Midterm break: Nov 09-11.

Lectures are on MWF 11:00am-11:50am in TBA.

## PREREQUISITES

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MATH 320, MATH 321

MATH 420, MATH 421 are recommended but not required

## BRIEF COURSE DESCRIPTION

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The goal of MATH 512 is to introduce mathematical methods of quantum theory. No prerequisite of quantum physics is required.

The course will cover some aspects of functional analysis, operator theory and the calculus of variations with short excursions into representation theory and operator algebras. The physical axioms of quantum theory will be introduced and elementary results will be discussed.

We will introduce the Hilbert space formulation of quantum theory, discuss quantum dynamics and its relation to spectral properties of linear operators. We will also study the role of symmetries in quantum physics, in particular the rotation group thereby introducing the intrinsically quantum notion of spin. The course will conclude with a short study of strongly interacting systems and the role of locality in their analysis.

## LEARNING MATERIALS

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The course material is defined by what is covered in the lectures. Additional reading is welcome and can be found in the following books:

- *Analysis* by E. Lieb & M. Loss
- *Mathematical methods in quantum mechanics, with applications to Schrödinger operators* by G. Teschl
- *Mathematical concepts of quantum mechanics* by S. Gustafson & M. Sigal
- *Methods of modern mathematical physics I & II* by M. Reed & B. Simon
- *Quantum spin systems on infinite lattices, a concise introduction* by P. Naaijken
- *Quantum Mechanics* by G. Auletta, M. Fortunato & G. Parisi

## ASSESSMENTS OF LEARNING AND COURSE GRADE

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There will be

1. Five homework assignments
2. One final exam

The course grade will be given by

$$\max\{0.75G_H + 0.25G_F, 0.5G_H + 0.5G_F\}$$

where  $G_H$  is the average grade of the assignments and  $G_F$  is the grade of the final exam.

## SYLLABUS POLICIES

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General UBC and Mathematics Department policies can be found [here](#).

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