

THE UNIVERSITY



OF HONG KONG

*Institute of Mathematical Research*

*Department of Mathematics*

## **Topics in Geometry I**

Dr. J.H. Lu

The University of Hong Kong

We will give an introduction to the theory of Riemannian symmetric spaces. More specifically, by first establishing the relation between Riemannian symmetric spaces and symmetric Lie algebras, we show that any symmetric space may be decomposed into the product of irreducible ones, of which there are three types: Euclidean, noncompact, and compact. We will describe in more detail the latter two types and their relation to real semi-simple Lie algebras. We will discuss the classification of real semi-simple Lie algebras by their Vogan diagrams. If time permits, we will explain some natural Poisson structures on compact and non-compact Riemannian symmetric spaces and the duality between them.

Prerequisites for the course are some basic knowledge of Riemannian geometry such as what is covered in the first seven chapters of Do Carmo's book "Riemannian Geometry: A Modern Introduction" and some basic knowledge of complex semi-simple Lie algebras.

There will be a total of 6 lectures of 90 minutes each. The series of lectures is also offered as the first half of the graduate course MATH6201.

*References:*

1. Differential Geometry, Lie Groups, and Symmetric Spaces, by Sigurdur Helgason
2. Semisimple Groups and Riemannian Symmetric Spaces, by Armand Borel.

Lecture 1:	January 28, 2004 (Wednesday)	3:00 – 5 :00pm
Lecture 2:	February 4, 2004 (Wednesday)	3:00 – 5 :00pm
Lecture 3:	February 11, 2004 (Wednesday)	3:00 – 5 :00pm
Lecture 4:	February 18, 2004 (Wednesday)	3:00 – 5 :00pm
Lecture 5:	February 25, 2004 (Wednesday)	3:00 – 5 :00pm
Lecture 6:	March 3, 2004 (Wednesday)	3:00 – 5 :00pm

*Lectures will be held in Room 517, Meng Wah Complex*

*All are welcome*