Course Description

Department of Mathematics

Nature of the course ☐ required ☑ elective	Area 麻煩老師勾選類別，或直接填寫_____。 ☐代數與數論 ☐分析 ☑幾何與拓樸 ☐計算與應用數學 ☐機率 ☐統計 ☐離散數學 ☐其他 ☐論文研討、獨立研究			
Calculus	☐ Calculus A ☐ Calculus B			
Course number		Section number	免填	Number of credits	3
Course title	課程名稱：微分幾何二 Differential Geometry (II)			
Instructor	教授：蔡忠潤			
開設學期： ☐上學期 ☑下學期 ☐全學年	上課時間： 星期　　節次	開課對象：☐大學生 ☐研究生 ☑皆可		

I. **＊Contents**：

- For the first half of this semester, we will do fundamental theories for Riemannian manifolds.

  i. Materials from chapter 1 of [CE]: basically, results from ODE comparison techniques.

  ii. de Rham-Hodge theory, which provides a decomposition of differential forms by using the metric, and the geometry of the metric is in a way captured by the representatives of the de Rham class.

- For the second half of this semester, we will do some advanced topics. What follows are some possible topics.

  i. Eigenvalues of Laplace and geometry.

  ii. Milnor's exotic seven-spheres.

  iii. Some gauge theory topics. Possible candidate: twistor space construction and relevant stories.

II. **Course prerequisite**：

This course assumes knowledge covered by the course of Differential Geometry (I).

III. **＊Reference material (textbook(s))**：

1. [CE] Jeff Cheeger and David Ebin, *Comparison theorems in Riemannian geometry.*

2. [W] Frank Warner, *Foundations of differentiable manifolds and Lie groups.*

3. [T] Clifford Henry Taubes, *Differential geometry. Bundles, connections, metrics and curvature.*

4. [dC] Manfredo Perdigão do Carmo, *Riemannian geometry*

5. For the second half of the course: relevant research articles.

IV. **＊Grading scheme**：請填寫各項計分之百分比，例如：期中 30% 期末 40% 作業 10% 報告 20%，總計 100%

Homework 30%, Midterm 30%, Final 35%, Course participation 5%.

V. **＊Course Goal**：

Based on the background material covered last semester, we aim to explain some ideas and techniques that are used very often in current geometry research.