課程大綱及進度表

開課系所	數學系
開課學年	101 學年度
開課學期	上學期
課程名稱(中文)	雙曲偏微分方程
課程名稱（英文）	Hyperbolic Partial Differential Equations
課程碼	L166800
分班碼	星期一 7, 8　星期五 4　(3177)
先修科目或先備能力	高等微積分，微分方程和偏微分方程（一）
學分數	3
開課教師	方永富
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電話	275-7575 轉 65131
Office Hours	Mon and Fri: 12:10 - 13:00, and plus appointments

課程概述　　We study the concepts and hyperbolic types of PDE, and their properties, including the geometry of Minkowski spacetime. Then we discuss the fundamental solutions for Klein-Gordon equation, for Dirac equation, for Schr\"odinger equation, and for wave equation. Next we investigate the low regularity global well-possedness for the Zakharov system and for Dirac-Klein-Gordon equations. Finally we consider the scattering problem for the cubic nonlinear Klein-Gordon equation and for the Dirac-Klein-Gordon equations.

教學目標　　We expect students to grab the basic idea and concept of PDE. Then we learn various properties of important types of PDE from different aspects. We focus on the wave type equations and emphasize the geometry depicted in the equations, *i.e.* the geometry of Minkowski spacetime. We expect students to learn the regulairy problem and scattering problem for the equations.

授課課程大綱明細

Ch01: Geometry of Minkowski Spacetime

Ch02: Long Range Scattering for the Nonlinear Klein-Gordon Equation

Ch03: Asymptotic Completeness for the Critical Nonlinear Klein-Gordon Equation

Ch04: Low Regularity Global Well-posedness for the Zahkarov System

Ch05: Low Regularity Global Well-posedness for the Klein-Gordon-Schr\"odinger System

Ch06: Bilinear Local Smoothinng Estimate for Airy Equation

Ch07: Global solutions for the Dirac-Klein-Gordon system in two space dimensions

參考書目　Partial Differential Equations, An Introduction (Chapter 1 - 12)　by　Walter Strauss

　　　　　Lectures On Nonlinear Hyperbolic Differential Equations　by　Lars H\"ormander

　　　　　Harmonic Analysis　by　E. M. Stein

課程要求　　　Advanced Calculus, Differential Equations, and PDE (I)

評量方式　　　Homework:　40%　　Presentation:　　60%

缺席扣分原則：缺席一堂課扣學期成績一分

課程網址　　　http://www.math.ncku.edu.tw/~fang

助教資訊

備註