

數學系課程核心教材內容

課程名稱：(中文) 偏微分方程(一) (英文) Partial Differential Equations (I)			開課單位	應數碩博班
			課程代碼	2105203
學分數	3	必/選修	選	開課年級
一				
<p>教學目標：The basic knowledge of the differential equations and some properties of important types of PDE.</p> <p>課程概述：We state some basic concepts. Then we study the first order, second order linear equations. At last, we learn the Cauchy problems.</p> <p>先修科目或先備能力：Advanced Calculus</p>				
建議參考書目	Partial Differential Equations by Fritz John. PDE by Lawrence C. Evans.			

課程大綱

單元主題	內容綱要	上課週數
Introduction	Classification, Differential equations as mathematical models, Simple examples	1~2 weeks
First-order equations	Quasilinear equations, The method of characteristics, Examples, The Lagrange method, Conservation laws and shock waves, The eikonal equation, General nonlinear equations	6~7 weeks
Second-order linear equations ()	Classification, Canonical form of hyperpolic (and parabolic, elliptic) forms	2-3 weeks
The one-dimensional wave equation	Canonical form and general solution, The Cauchy problem and d'Alembert's formula, Domain of dependence and region of influence, The Cauchy problem for the nonhomogeneous wave equation	3-4 weeks
Characteristic Manifolds and the Cauchy problem	Laurent Schwarz problems, The Cauchy problem, Real analytic and Cauchy-Kowalevski theorem, The uniqueness theorem of Holmgren problem	4-5 weeks

數學系課程核心教材內容

課程名稱：(中文) 偏微分方程(二) (英文) Partial Differential Equations (II)				開課單位	應數碩博班
				課程代碼	2105204
學分數	3	必/選修	選	開課年級	一
<p>教學目標：We aim to present a reasonably large range of methods. We will study the basic ideas and concepts of pseudo-differential operators.</p> <p>課程概述：We first introduce the distributions. Then we learn the symbols and the Sobolev space. At last, we study the regularity of elliptic PDE.</p> <p>先修科目或先備能力：Advanced Calculus, Real Analysis</p>					
建議參考書目	<ol style="list-style-type: none"> 1. Pseudo-differential Operators by Michael E. Taylor (Princeton University Press) 2. PDE by Fritz John. 3. PDE by Lawrence C. Evans. 				

課程大綱

單元主題	內容綱要	上課週數
Distributions	The convolution, The Fourier transform, The Planchel theorem, Tempered distributions	6-7 weeks
A partition of Unity and Taylor's formula	A partition of Unity, Taylor's formula	1-2 weeks
Symbols	Pseudodifferential operators, asymptotic expansions and its operations	5-6 weeks
The Sobolev space	The Sobolev space, Extensions, trace, Imbedding theorem	2-3 weeks
Regularity of elliptic Partial Differential Equations	Differentiability of weak solutions, Global regularity	1-2 weeks