數學系課程核心教材內容

課程名稱：(中文) 泛涵分析(一)				開課單位	應數碩博班
(英文) Functional Analysis (I)				課程代碼	2105003
學分數	3	必/選修	選	開課年級	一
教學目標：介紹基本泛涵概念					
課程概述：函數空間介紹、算子理論					
先修科目或先備能力：高等微積分(一)(二)					
建議參考書目	1. Eidelman, Milman and Tsolomitis, *Functional analysis*: An Introduction. 2. R. Kress, *Linear Integral Equations*. 3. K. Yoshida, *Functional Analysis*.				

課程大綱

單元主題	內容綱要	上課週數
Linear spaces; Normed spaces	Linear spaces, Normed spaces, Holder inequality, Minkowski inequality, Completeness, Completion, Construction of completion	2 weeks
Hilbert spaces	Cauchy-Schwartz inequality, Bessel's inequality, Gram-Schmidt orthogonalization procedure, Parseval's equality, Projections,decompositions, Orthogonal decomposition, Linear functionals, Bounded linear functionals, An Example of a non-separable Hilbert space	3 weeks
The dual space	Hahn-Banach theorem and its consequences, Dual Spaces	2 weeks
Bounded linear operators	Completeness of the space of bounded linear operators, Compact operators, The space of compact operators, Dual Operators, convergences, Invertible Operators, Self-adjoint bounded operators, projection operators, Functions of operators	2 weeks
The Fundamental Theorems	The open mapping theorem, The Closed Graph Theorem, The Banach-Steinhaus Theorem, Hahn-Banach Theorem.	3 weeks
Spectral theory	Classification of spectrum, Riesz theory, Fredholm Theory of compact operators	4 weeks

數學系課程核心教材內容

課程名稱：(中文) 泛涵分析(二)				開課單位	應數碩博班
(英文) Functional Analysis (II)				課程代碼	2105004
學分數	3	必/選修	選	開課年級	一
教學目標：泛涵應用 課程概述：位勢論, Sobolev 空間、積分方程 先修科目或先備能力：高等微積分(一)(二)					
建議參考書目	1. Eidelman, Milman and Tsolomitis, *Functional analysis*: An Introduction. 2. R. Kress, *Linear Integral Equations*. 3. K. Yoshida, *Functional Analysis*.				

課程大綱

單元主題	內容綱要	上課週數
Potential Theory	Harmonic functions, Dirichlet and Neumann Boundary value problems, Uniqueness and Existence, surface potentials	5 weeks
Sobolev spaces	Sobolev space $\mathbb{H}^P$ for a domain and for boundary, weak solutions	3 weeks
Operator approximations	Norm convergence, Uniform boundedness principle, collectively compact operators, pointwise convergence successive approximations	2 weeks
Numerical methods	Interpolations, Quadrature methods, projection methods	2 weeks
Equations of the first kind	Ill-posed problems, regularization, SVD	2 weeks
Inverse boundary value problems	Inverse problems in potential theory	2 weeks