數學系課程核心教材內容

課程名稱：(中文）實變函數(一) (英文）Real Analysis (I)				開課單位	應數碩博班
				課程代碼	2105001
學分數	3	必/選修	必修	開課年級	一

教學目標：This course will be an introduction to abstract measure theory and the Lebesgue integral.

課程概述：We will construct Lebesgue measure, define the Lebesgue integral, and prove the main convergence theorems. Topics, like L^p -spaces, Radon-Nikodym Theorem, Lebesgue Differentiation Theorem, Fubini Theorem are included.

先修科目或先備能力：Advanced caluculs

建議參考書目	1. Wheeden & Zygmund, *Measure and Integral*: An Introduction to Real Analysis (Pure and Applied Mathematics), CRC Press, Nov. 1, 1977, ISBN: 0824764994. 2. Royden, *Real Analysis*, Prentice Hall Publishers, Feb. 2, 1988, ISBN: 0024041513.

課程大綱

單元主題	內容綱要	上課週數
Lebesgue Measure and Outer Measure	σ-algebra, Borel sets, Measure spaces, Littlewood 3 principles, Cantor sets, Cantor-Lebesgue functions, Caratheodory measurable sets, Steinhaus theorem, Vitali nonmeasurable sets	4weeks
Lebesgue Measurable Functions	Lusin theorem, Egorov theorem, Convergence a.e.	4weeks
Lebesgue Integral	Convergence theorem (MCT, LDCT, BCT, UCT), Fatou lemma, Tchebyshey inequality, Relation between R-S integral and Lebesgue integral	8 weeks

數學系課程核心教材內容

課程名稱：(中文）實變函數(二) (英文）Real Analysis (II)				開課單位	應數碩博班
				課程代碼	2105002
學分數	3	必/選修	必修	開課年級	一

教學目標：This course will be an introduction to abstract measure theory and the Lebesgue integral.

課程概述：We will construct Lebesgue measure, define the Lebesgue integral, and prove the main convergence theorems. Topics, like L^p -spaces, Radon-Nikodym Theorem, Lebesgue Differentiation Theorem, Fubini Theorem are included.

先修科目或先備能力：Advanced caluculs, Real Analysis (I)

建議參考書目	1. Wheeden & Zygmund, *Measure and Integral*: An Introduction to Real Analysis (Pure and Applied Mathematics), CRC Press, Nov. 1, 1977, ISBN: 0824764994. 2. Royden, *Real Analysis*, Prentice Hall Publishers, Feb. 2, 1988, ISBN: 0024041513.

課程大綱

單元主題	內容綱要	上課週數
Repeated Integration	Fubini theorem, Tonelli theorem, Convolution	2weeks
Differentiation	Indefinite integral, Absolute continuous, Lebesgue differentiation theorem, Vitali covering lemma, Lebesgue differentiation theorem, Hardy-Littlewood theorem, Monotone functions, Convex functions, Functions of Bounded Variational, Jordan theorem, Riemann-Stieltjes integral	6weeks
L^p classes	Essential supremum, Normed linear spaces, Banach Spaces, Hilbert spaces, Baire category theorem, L^P spaces, ℓ^p spaces, Separable spaces, Dual spaces, Holder inequality, Minkowski inequality, Hahn-Banach theorem, Parseval formula, Bessel inequality, Complete orthonormal system, Riesz-Fischer theorem, Ascoli-Arzela theorem, Stone-Weierstrass theorem, Uryson lemma, Tietze extention theorem	3 weeks
Abstract Measure Theory	Signed measure, Additive set measure, Hahn decomposition theorem, Jordan decomposition, Radon-Nikodyn theorem	7weeks