### [全學年]

于靖:Introduction to group representations (1)

李秋坤:環論專題 (2)

## [上學期]

蕭欽玉:基本測度論及分佈論(3)

余正道:代數拓樸 (4) 康明昌:交換代數 (5) 陳其誠:代數數論 (6)

鄭日新: Geometry of several complex variables (7)

李元斌:量子上同調入門(8) 張志中:隨機過程導論(9)

王偉仲/陳素雲/陳君厚:資料科學之計算方法與工具

陳俊全:演化動力學 (10) 王藹農:極小曲面 (11)

陳宏:統計計算 (12)

## [下學期]

林長壽:複分析Ⅱ (13)

陳君明:密碼學導論 王金龍:D模 (14)

李元斌:量子上同調專題 (15)

張樹城:瑞曲流 Ⅱ(16)

蕭欽玉:柯西黎曼流形上的分析與幾何(17)

林大溢:大數據理論及實務應用 (18)

韓傳祥:數理金融導論 黃信誠:統計學習 (19) 王偉仲:數學軟體 (20) 江金倉:廣義線性模型

王振男/林太家:Special topics of PDE and its applications

黃啟瑞: 隨機微機分

### [暑期密集課程]

為鼓勵學生參加 NCTS 暑期課程,今年暑假將開設 3 門暑期短期密集的課程作為台大數學系的正式課程

(有學分數)

Area 麻煩老師勾選類別,或直接填寫。 Nature of the course	
□ required □ elective □ elective □ required □ require	
□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	
Course title 課程名稱: Introduction to Group Representations	
Instructor 教授: 干 靖	
I. *Contents: 這個深程導入军表現理論,包括有限军,要级军从从局部紧锁军的表现。所用工具从代数為主,也會用期合分析, Haor積分,分佈及複分析。在有限军表现, 也處理基本的模表现, 局部緊鎖军表現則包含了一從军, Adelic 军的自守表现	
1. * Contents: 23/12/24 + 4/4 H # Contents: 13/12/24 + 4/4 H # Contents: 1	
的表现。则用工具从代表的工,也可用3月10万千月日3月15万,万种从被万千月。在月16年	,
表现,也處理基本的模表现。局部等級年表現且10名7-距看,Adelica的自守表现	0
II. Course prerequisite:	
代数(代等)、 维性代數, 分析(分析等論)	
III. * Reference material (textbook(s)):	
1. C. Bonnafe: Representations of SL2 (tre) - Theory Cambridge 71 Pro	od
2. D. Bump: Automorphic Forms and Representation (Victory, Campillage of the	
1.C.Bonnafé: Representations of SL2 (Fg). Springer 2011. 2.D. Bump: Automorphic Forms and Representation Theory, Cambridge V. Pre 3. JP. Some: Linear Representations of finite groups Springer GTM	
IV. * Grading scheme: 請填寫各項計分之自分比,例如: 期中 30% 期末 40% 作業 10% 報告 20%,總計 100%	6
作業 50% 報告 50%	
V. * Course Goal:	
E-mail YAL	

- 1. \*號為必填欄位
- 2. 大綱內容字數英文最少 200 字以上

## Introduction to Group Representations.

### Contents.

We introduce group representations for finite groups, compact groups, and locally compact groups. The later includes p-adic groups, adelic groups, i.e. automorphic representations of algebraic groups over global fields. We will use algebraic tools primarily. But we will also bring in tools from harmonic analysis, Haar integrals, complex analysis, and distribution theory. We will do classification of representations for classes of groups. Will also apply representation theory to problems arising and connected with other fields of mathematics, particularly number theory and arithmetic geometry.

### Course Goal.

Representations of groups play a central role in mathematics. Great progress had been made in the last century which lead to solutions of many key problems in mathematics. Currently, the developments of representation theory of groups involves most active frontier researches. Our goal is to introduce students this very important field. This course is suitable for advanced undergraduates as well as beginning graduate students. It connects all the basic courses, algebra and analysis. It underlines to students the fact that combining all the fundamental tools previously learnt is essential for doing modern mathematics researches.

		Department of Mathematics
Noture of the course		Area 麻煩老師勾選類別,或直接填寫。
Nature of the course ☐ required ☐ e	lective	□代數與數論 □分析 □幾何與拓樸 □計算與應用數學
1		□機率 □統計 □離散數學 □其他 □論文研討、獨立研究
	Calculus A	□ Calculus B
Course number		Section number
Course title	課程名稱:	3 ge 1/20 By 1/30 X 11 11 11
Instructor	教授:	The The figure of creatis
I. *Contents:		
研览	定任事品	影奉研究之物图满文/细能再被
II. Course prereq	uisite :	
25	段角兹	最高之基本气线、
III. *Reference n		
	富文	
IV. *Grading sch	neme: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%
<b>(</b>	预定计	编决定或绩
V. *Course Goa		
(A	李湿1	新夏7年文研究
·		

- 1. \*號為必填欄位
- 2. 大綱內容字數英文最少 200 字以上

Department of Mathematics								
Nature of the course ☐ required ☐ elective		分析						
Calculus	☐ Calculus A	☐ Calculus B						
Course number		Section number	免填		Number	of credit	S	2
Course title	課程名稱: theory)	基本測度論及分	·佈論	(Basic	measure	theory	and	distribution
Instructor	教授: Chin	-Yu Hsiao 蕭欽玉						
I. *Contents:								

- [I] A review of differential calculus in Euclidean space
- [II] Lebesgue measure in Euclidean space.
- [III]Lebesgue integral in Euclidean space.
- [IV] \$L^ p\$ spaces in Euclidean space.
- [V] The Fubini theorem.
- [VI]Test functions, convolution, cutoff functions and partitions of unity.
- [VII] Definition and basic properties of distributions.
- [VIII] Applications of distribution theory

#### II. Course prerequisite:

高微,線代.

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

自編講義.

- \*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 IV. 10
- V. 期中:%,30期末:40%作業:30%

#### VI. \* Course Goal:

這是一門專為大學部修過高微的學生開的分析課程.. 測度論是近代分析學最基本的工具.

這們課第一部份將會仔細的介紹歐式空間的測度論; 我將在不預設太多的預備知識下, 儘量讓學生

解歐式空間中的測度論. 希望上完這門課的測度論之後, 學生更容易接受研究所的實分析課程. 這門課的第二部份將會仔細的介紹基本的分佈論(distribution theory). Distribution 的概念由法國數學家 Laurent Schwartz 在 1940 年代引入. 現代的

distribution theory 基乎是近代 PDE, Harmonic analysis, Fourier analysis 甚至 Geometric analysis 的基礎. 上完基本測度論後, 我會介紹最基本的 Distribution Theory 並由 Distribution Theory 的觀點來處理之前就學過的分析題材, 如 GaussGreen formula, Stoke formula, Cauchy integral formula, Weierstrass theorem 及古典的 potential theory. 希望上完這門課的分佈論之後,學生更容易接受研究所的 PDE, Harmonic analysis, Fourier analysis 等課程.

這門課,我之前有開過,當時是三學分,現雖為兩學分,但我會努力的把上課內容作到和之前的課一樣.此外,和之前的課不一樣的地方在於,今年我會更強調習題.除了正課外,希望每週會有一小時的習題課.

- 1. \*號為必填欄位
- 2. 大綱內容字數英文最少 200 字以上

## Department of Mathematics

Nature of the course: Elective		Area: 幾何與拓樸			
Course number		Section number	免填	Number of credits	3
Course title	課程名稱:	課程名稱:代數拓樸 (Algebraic Topology)			
Instructor	教授:余正	 道	_		

### I. \* Contents:

- 1. Homology
- 2. Cohomology
- 3. Fundamental group
- 4. Sheaves in topology

## II. Course prerequisite:

Familiar with basics of point-set topology (e.g. touched in Introduction to Analysis)

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

Hatcher, Algebraic topology.

Dimca, Sheaves in topology.

## IV. \* Grading scheme:

Homework assignments (40%), midterm (30%), oral presentation (30%)

## V. \* Course Goal:

The languages, ideas and tools emerged from algebraic topology have become indispensable in all areas of mathematics. One aim of this course is to provide a quick and intense introduction to important contents in algebraic topology. The final part is to go into the theories of categories and sheaves. The goal is to prepare students with working knowledges in algebraic topology, which are impartant in modern developments in geometry, e.g., in the study of singular spaces.

Nature of the course		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
☐ required ☐ el	lective	□機率 □統計 □離散數學 □其他 □論文研討、獨立研究
Calculus	alculus A	□ Calculus B
Course number		Section number
Course title	課程名稱:	Commutative Algebra
Instructor	教授:	
I. *Contents : I	ocalization, in	ntegral extension, differentials, smooth morphisms
II. Course prereque Algebra I,II	uisite :	
III. *Reference m	aterial ( textb	$\operatorname{book}(s)$ ):
Atiyah and MacDma	ald, Introduction	on to commutative algebra
Matsumma, Commu	tative ring the	ory
Hartshorne, Algebrai	ic geometry	
IV. *Grading sch	eme:請填寫名	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, 20%		
Final examination, 8	0%	
V. *Course Goal	l:	
we recall sheaves of non-singular varietie	F modules on a	alization, integral extensions and dimensions of commutative rings. Then a scheme. In particular, we will introduce the sheaves if differentials and flat morphisms and smooth morphisms.

- 1. \*號為必填欄位
- 2. 大綱內容字數英文最少 200 字以上

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 □幾何與拓撲 □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	alculus A	□ Calculus B			
Course number		Section number			
Course title	課程名稱:	algebraic number theory			
Instructor	教授: Ki-S	Seng Tan			
I. *Contents : A	I. *Contents: Algebraic Numbers, Algebraic Integers, Dedekind Domain, Class Groups, Units, Class				
Number Fo	ormula, Densit	y Theorem.			
II. Course prerequ	<b>uisite</b> Introduc	etion to Algebra			
III. *Reference m					
		\$項計分之百分比,例如:期中 30% 期末 40% 作業 10% 報告 20%,總計 100%			
To be determine	ned.				
V. *Course Goal	l:To introduc	e to students the number theory developed (mainly) in the 19 <sup>th</sup> century.			

- 1. \*號為必填欄位
- 2. 大綱內容字數英文最少 200 字以上

		Department of Mathematics
Notana of the connec		Area 麻煩老師勾選類別,或直接填寫 多複變幾何分析。
Nature of the course ☐ required ☐ el	ective	□代數與數論 v□分析 v□幾何與拓樸 □計算與應用數學
in required in the	ective	□機率 □統計 □離散數學 □其他 □論文研討、獨立研究
Calculus	alculus A	□ Calculus B
Course number		Section number
Course title	課程名稱:	Geometry of Several Complex Variables
Instructor	教授: Jih-l	Hsin Cheng
I. *Contents:		
Basic theory of sever	ral complex va	riables (SCV), Geometry of boundary of a complex domain, positive
mass theorem, Levi i	mean curvature	e, p-mean curvature, Alexandrov-type problem, isoperimetric problem in
		acture, local embedding problem, index formula.
Treisenderg group, in	ows of CR sur	acture, rocar embedding problem, maex formata.
II. Course prerequ	uisite :	
Theory of one compl	lex variable, B	asic differential geometry, Basic elliptic PDE (preferred).
III. *Reference m	aterial ( textb	$\operatorname{ook}(s)$ ):
Relevant books and	papers, e.g., So	o-Chin Chen and Mei-Chi Shaw's book on SCV, Howard Jacobowitz's
book on CR structure	es, Cheng-Mal	chiodi-Yang's paper on CR positive mass theorem, Cheng-Hsiao-Tsai's
paper on local index	formula for C	R manifolds with S^1 action, my other papers (with Jenn-Fang Hwang,
		, and Paul Yang) on p-mean curvature equation, etc
Trung-Lin Cinu, And	ica iviaiciiioui	, and Faur Tang) on p-mean curvature equation, etc
IV at Cas dia a sala	o o * 1+ 1+ 1+ 1+	
IV. *Grading sch	eme· 請與馬名	·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: 80%		
Report (oral or writte	en): 20%	
V. *Course Goal	l:	
Lexpect that students	s can start wor	king on some research problems in this field after the course.
	. Juli Start WOI	

- 1. \*號為必填欄位
- 2. 大綱內容字數英文最少 200 字以上

Nature of the course	4	Area 麻煩老師勾選類別,或直接填寫Algebraic Geometry。			
	C elective	☐ Algebra ☐ Analysis ☒X Geometry ☐ Statistics			
La required WA	CICCIIVE	☐ Applied Mathematics ☐ Discrete Mathematics ☐ Others			
Calculus $\square$ (	Calculus A	□ Calculus B			
Course number	免填	Section number			
Course title	課程名稱(英	(文) Introduction to Gromov-Witten theory			
Instructor	教授 Y.P. Le	ee 李元文武			
* Contents. This	is the first sem	ester of a 2-semester sequence of course in GromovWitten theory.			
		ester of a 2-semester sequence of course in Gromov written incory.			
Possible topics inclu	udes				
V 11: 6					
	curves and map				
	idamental cycle				
		intersection theory. (Virtual) localization.			
• Givental's	formulation.				
but I also get to kno	ow the students	ts of this approach are manifold. Not only would the students learn better, better. Furthermore, this way the lectures can move at a brisk pace while			
Course prerequisi		iscussed in details during the student seminars.			
1 1		braic geometry and topology.			
	te: Basic alge	braic geometry and topology.			
* Reference mate	te: Basic alge				
* Reference mater semester.	te: Basic alge	braic geometry and topology.  (s): No textbook. The material will be assigned throughout the			
* Reference mater semester.  * Grading scheme	te: Basic alge rial ( textbook e: 請填寫各項言	braic geometry and topology.  (s): No textbook. The material will be assigned throughout the  计分之百分比,例如:期中 30% 期末 40% 作業 10% 報告 20%,總計 100%.			
* Reference mater semester.  * Grading scheme No exam. The grad	te: Basic alge rial ( textbook e: 請填寫各項言	braic geometry and topology.  (s): No textbook. The material will be assigned throughout the			
* Reference maters semester.  * Grading scheme No exam. The grad Others:	te: Basic alge rial ( textbook e: 請填寫各項記 des are decided	braic geometry and topology.  (s): No textbook. The material will be assigned throughout the 计分之百分比,例如:期中 30% 期末 40% 作業 10% 報告 20%,總計 100%. by the presentation in the seminars and performance in the class.			
* Reference maters semester. * Grading scheme No exam. The grad Others:	te: Basic alge rial ( textbook e: 請填寫各項記 des are decided	braic geometry and topology.  (s): No textbook. The material will be assigned throughout the 计分之百分比,例如:期中 30% 期末 40% 作業 10% 報告 20%,總計 100%.			
* Reference maters semester.  * Grading scheme No exam. The grad Others:	te: Basic alge rial ( textbook e: 請填寫各項記 des are decided	braic geometry and topology.  (s): No textbook. The material will be assigned throughout the 计分之百分比,例如:期中 30% 期末 40% 作業 10% 報告 20%,總計 100%. by the presentation in the seminars and performance in the class.			
* Reference maters semester.  * Grading scheme No exam. The grad Others:	te: Basic alge rial ( textbook e: 請填寫各項記 des are decided	braic geometry and topology.  (s): No textbook. The material will be assigned throughout the 计分之百分比,例如:期中 30% 期末 40% 作業 10% 報告 20%,總計 100%. by the presentation in the seminars and performance in the class.			
* Reference maters semester.  * Grading scheme No exam. The grad Others:	te: Basic alge rial ( textbook e: 請填寫各項記 des are decided	braic geometry and topology.  (s): No textbook. The material will be assigned throughout the 计分之百分比,例如:期中 30% 期末 40% 作業 10% 報告 20%,總計 100%. by the presentation in the seminars and performance in the class.			
* Reference maters semester.  * Grading scheme No exam. The grad Others:	te: Basic alge rial ( textbook e: 請填寫各項記 des are decided	braic geometry and topology.  (s): No textbook. The material will be assigned throughout the 计分之百分比,例如:期中 30% 期末 40% 作業 10% 報告 20%,總計 100%. by the presentation in the seminars and performance in the class.			

- 1. \*號為必填欄位
- 2 大綱内交空動茁立最小 200 空以上

Nature of the	course	Area	
☐ required	□ elective	☐ Algebra ☐ Analysis ☐ Geometry ☐ Statistics	
		☐ Applied Math. ☐ Discrete Math. ☐ Probability	
Calculus	☐ Calculus A	□ Calculus B	
Course number	221 U4410	Section number Number of credits	3
Course title	INTRODUCTIO	ON TO STOCHASTIC PROCESSES	
Instructor	CHIH-CHUNG	CHANG 張志中	
1. Contents: ma	artingales, discret	e-time Markov chains, and Poisson processes.	
2. Course prere	equisite: elementa	ry probability theory, linear algebra, and advanced calculus.	
3. Reference ma	terial (textbook(s	)):	
(a) Markov ch	nains and mixing	times. By D. A. Levin, Y. Peres, and E. L. Wilmer. AMS 200	)8
(a) Introduction	on to stochastic pr	rocesses. By G. F. Lawler. Chapman & Hall/CRC, 2 <sup>nd</sup> edition	n.
(b) Essentials	of stochastic pro-	cesses. By R. Durrett, Springer, 1999.	
(c) An Introdu	action to Markov	Processes. By D. W. Stroock. Springer, 2005.	
4. Grading scho	eme:		
Recitation,	homework, oral	presentation, and final exam. (日か七月本記)	
		to model, and the technique to analyze, the random pheno	omena
evolving wit	th time.	访问共新创演溢到起部伶目学时兴趣。此领域许多研究课题而废	
· 女 对 对	宣忠要 Mank	ou chains/classical random walks is 基本了商	182
为主部	以指引方的	的。本课程之目的之一即在丹科未杨	考文
· 持多可能";	的访问,甚	主指导学生,做一重它基础之工作。	
			中

		Department o	n iviamenna	ucs		
Nature of the course		Area 麻煩老師勾達	<b>醫類別,或直</b>	[接填寫	0	
□ required elective		□代數與數論 □分析 □幾何與拓樸 計算與應用數學				
in required en	ective	□機率 □統計	□離散數學	□其他 □論文研討、獲	<b>前立研究</b>	
Calculus	alculus A	☐ Calculus B				
Course number		Section number	免填	Number of credits	2	
Course title 課程名稱:演化動力學(Evolutionary Dynamics)						
Instructor 教授: 陳俊全						
I. *Contents:						
Evolution is a central	I theme in biol	ogy. It is also very im	nportant in ag	ricultural, medical, and soc	cial sciences.	
The course introduce	es basic mathe	matical principles in	evolutionary	dynamics and the issue ho	ow .	
cooperation emerge	s among selfis	h individuals. The co	ntents cover	the Nash equilibrium, evol	utionarily	
stable strategy, socia	l dilemmas of	cooperation, effects	of direct and	indirect reciprocity, mode	ls involving	
reputation, and rewa	ards and punis	hment in the mainte	nance of coo	peration.		
	•			•		
II. Course prerequ	uisite :					
		1, 66				
Linear algebra, calcu	ilus, ordinary c	lifferential equations				
III. *Reference m	aterial ( textb	ook(s) ) :				
Karl Sigmund: The Ca	alculus of Selfi	shness, Princeton Ur	niversity Press	s, 2010.		
			•			
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%						
11. 1 Claumg benefite : 明实为 4. 10. 17. 10. 17. 10. 10. 17. 10. 10. 10. 10. 10. 10. 10. 10. 10. 10						
V. * Course Goal	<b>:</b>					
The course introduce	es basic concep	ots in evolutionary g	ame dynamic	S.		

- 1. \*號為必填欄位
- 2. 大綱內容字數英文最少 200 字以上

好级

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7	Conformal structure of minimal surfaces.  7.1 Recurrence and parabolicity for manifolds.  7.2 Universal superharmonic functions.  7.3 Quadratic area growth and middle ends.	71 71 74 76
8	Uniqueness of the helicoid I: proper case.	81
9	Embedded minimal annular ends with infinite total curvature.  9.1 Harmonic functions on annuli	85 85 87
10	The embedded Calabi-Yau problem.  10.1 Uniqueness of the helicoid II: complete case	<ul><li>95</li><li>95</li><li>98</li></ul>
1	1 Local pictures, local removable singularities and dynamics.	105
1:	2 Embedded minimal surfaces of finite genus.  12.1 The Hoffman-Meeks conjecture	119 122
13	3 Topological aspects of minimal surfaces.	131
1	4 Partial results on the Liouville Conjecture.	141
1	5 The Scherk Uniqueness Theorem.	145
1	6 Calabi-Yau problems.	149
1	7 Outstanding problems and conjectures.	153

	D e p a	ertment of Mathematics
Nature of the  ☐ required	course ☑ elective	Area  ☐ Algebra ☐ Analysis ☐ Geometry ☑ Statistics ☐ Applied Mathematics ☐ Discrete Mathematics ☐ Other
Calculus	☐ Calculus A	□ Calculus B
Course number	221 U2000	Section number Number of credits 3
Course title	統計計算 STA	TISTICAL COMPUTING
Instructor	Hung Chen 陳宠	<del>-</del> <del>-</del> <del>-</del>
I. Contents:		
1 Simulation N	Methodology	
2 Monte Carlo	methods for stati	stical inference: Maximum Likelihood Estimation and EM
algorithm; b	ootstrapping; cros	s validation
3 Nonlinear re	gression and option	mization
		es ("statistical computing")
4 · Applications	s to Parametric Sta	atistics: linear regression and least squares (using numerical linear
algebra); ge	neralized linear m	nodels (using numerical optimization); iteratively reweighted least
squares and	generalized linea	r models; Lasso (using convex optimization)
5 · Applications	s to Nonparametri	c Statistics and beyond: density estimation (kernel density
estimation,	choice of bandwid	dth); regression function estimation ( spline smoothing,
computation	n of splines using	numerical linear algebra, principle component analysis using
numerical li	inear algebra)	
_	=	s, one semester of linear algebra or equivalent, Mathematical ered at Math department, some programming experience
III. 課程目標: T including stat		tational statistics techniques available to a wide range of users and scientists. We will discuss motivations, contents, approaches, odes.
IV. Reference m	aterial (textbook	(s)):
		material will be posted on course web
IV. Grading sche		
		Quizzes: 20%, Midterm: 30%
	g Chen e-mail: <u>hcl</u>	nen@math.ntu.edu.tw
Course Goal:		
1. To under	stand and be able	to use probability as the language of uncertainty.
2. To read s	statistical argume	nts critically.
3. To see he	ow statistics is do	ne in Science, Medicine, Education, Business, Government, Law,
Politics,	and other fields.	
4. To think	in probabilistic te	erms in dealing with risk in our daily lives.

5. To familiar with one statistical software.

		Department of Mathematics
N		Area 麻煩老師勾選類別,或直接填寫。
Nature of the course		□代數與數論 ■分析 □幾何與拓樸 □計算與應用數學
□ required elective		□機率 □統計 □離散數學 □其他 □論文研討、獨立研究
Calculus	alculus A	□ Calculus B
Course number		Section number
Course title	課程名稱:	複分析 II
Instructor	教授: 林長	<b>表</b>
		and I I I I I I a Consti
I. *Contents:	The course	will teach some elementary thrown of elliptic
functions (inc	luding the	will teach some elementary throng of elliptic Weierstrass and Jacobi throng), modular forms and
monodromy the	wy of li	rear ODE.
11. Course prerequ	uisite:	
2. Con	ylax Andy	sis del., I.
1. 1310	ianced ca	L CULUS
III. * Reference m	^	
E. Stein: Co	suplex and	alysis
W. Akhiezer	, Edd Ele	ments of the theory of elliptic functions.
IV. *Grading sch	eme:請填寫	we> 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%
	,	
Y	及粉革的	C. F. C.
V. * Course Goal	1:	
1 - N-	+ = 2	10 = (n pm/ = = = = = = = = = = = = = = = = = = =
理解都	\$ (4) 5	地及和盟的主题。
1	10 1-5	

- 1. \*號為必填欄位
- 2. 大綱內容字數英文最少 200 字以上

		Department of Mathematics					
Nature of the course		Area 麻煩老師勾選類別,或直接填寫。					
□ required elective		□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					
Course title	課程名稱:	D Modules					
Instructor	教授: 王金	<b>注</b> 龍					
I. *Contents:	I. *Contents:						
I will introduce D m	odules with en	nphasizes on the functorial properties. Then I will discuss specific					
examples including of	guantum D mc	odules and Hodge—Stokes structures.					
	1						
II. Course prereq	uisite :						
Basics in differential	l geometry alg	gebraic topology, and algebraic geometry in the level of Hartshorne's					
		sociale topology, and argeorate goometry in the level of flationomic of					
textbook chapter 2 a	iiu 3.						
III. *Reference m	•						
[1] Ginzburg: Lectur	es on D modu	les (1998 Chicago lectures).					
[2] Sabbah: Introduc	tion to Stokes	structures, Springer 2013.					
IV. *Grading sch	eme:請填寫名	<b>冬項計分之百分比,例如:期中 30% 期末 40% 作業 10% 報告 20%,總計 100%</b>					
No exams. Midterm	and Final scor	res are based on presentations of assigned material.					
V. *Course Goal	1:						
Many recent advance	ces on Rieman	nn_Hilbert correspondences integrable systems quantum cohomology					
	Many recent advances on Riemann—Hilbert correspondences, integrable systems, quantum cohomology, and mirror symmetry via refined study of Gauss—Manin connections require the machinery of D modules						
in an essential way.							
The goal of this course is however modest. I plan to prepare the fundamental part of the D modules theory, especially on the six operations in the derived category of D modules. I will also discuss several examples							
towards recent researches.							
-	It is expected that participants of this course will get enough background to read more advanced topics through assigned presentations.						

- 1. \*號為必填欄位
- 2. 大綱內容字數英文最少 200 字以上

Nature of the course		Area 麻煩老師勾選類別,或直接填寫_ Algebraic Geometry。					
	alaatiya	☐ Algebra ☐ Analysis ☑X Geometry ☐ Statistics					
☐ required ☐X elective		☐ Applied Mathematics ☐ Discrete Mathematics ☐ Others					
Calculus	alculus A	□ Calculus B					
Course number	免填 Section number 免填 Number of credits 4						
Course title	課程名稱(英	技文) Topics in Gromov-Witten theory					
Instructor 教授 Y.P. Lee 支 え え 対							
* Contents: This  Witten theory. Possible  Relative Gro Orbifold Gro Quasimap the Donaldson- The format of this classification of the production of the production of the same of the production	is the second some ble topics included and second	semester of a 2-semester sequence introductory course in Gromov-ludes  theory and degeneration formula.					

- 1. \*號為必填欄位
- 2 大綱内交之數茁立最小 200 空以上

名稱	瑞曲流 II The Ricci Flow II	
學期	105-2	
授課對象	數學系	數學所
課號	MATH	
班次		
學分(數)	3	
必/選修	選修	選修
教師	張樹城	
全/半年	半年	
上課時間	星期三 345	
上課地點	TIMS103	

## 課程大綱 1. Tensor calculus 課程概述 2. Kaehler geometry 4. The Ricci flow on Kaehler manifolds 課程目標 Shall be able to do research in this direction. 關鍵字 Ricci flow, kaehler Ricci flow 課程要求 Need some preliminary of the Ricci flow on Riemannian manifolds. 指定閱讀 参考書目 J. Song and B. Weinkove, Lecture notes on the Kaehler-Ricci flow 面談時間 另約時間

## Department of Mathematics

Nature of the course ☐ required ☐ el	lective	分析,幾何與拓樸			
Calculus		□ Calculus B			
Course number		Section number	免填	Number of credits	3
Course title	課程名稱: 幾何)	Analysis and Geom	netry on CR ma	nifolds (科西黎曼流	形上的分析與
Instructor	教授: Chir	n-Yu Hsiao 蕭欽玉			

#### I. \*Contents:

- (I)An introduction to CR manifolds
- (II)An introduction to Kohn Laplacian
- (III) Kohn-Hormander's L^2 estaimates for Kohn Laplaican
- (IV) An introduction to Microlocal Analysis: Pseudodifferential operators and Fourier integral operators
- (V) An introduction to Microlocal Analysis: Complex Fourier integral operators
- (VI) Microlocal analysis for Kohn Laplacian
- (VII) Boutet de Monvel-Sjostrand's theorem for Szego kernel and Fefferman's theorem for Bergman kernel
- (VIII) Analysis and Geometry on CR manifolds with S^1 action
- (IX) From CR geometry to Complex geometry. Deduce Kodaira vanishing Theorem, Kodaira embedding theorem, Tian-Yau-Zelditch asymnptotic exopansion.

## II. Course prerequisite:

Differential Geometry, P.D.E, real analysis.

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

自編講義.

V.

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

10

期中:25%, 期末:25% 報告:50%

### VI. \* Course Goal:

科西黎曼流形是非常重要的一類流形,在數學物理上伴演著重要角色. 最基本的例子就是複流形的邊界及一個解析線叢(holomorphic line bundle)的 circle bundle. 許多複幾何的結果都可從科西黎曼流形上的結果得到. 科西黎曼流形上的研究, 最困難的地方就是處理的算子 Kohn Laplacian 是一個非橢圓的算子, 甚至在許多情形下, 連次橢圓性都缺乏(non-hypoelliptic operator). 這門課除了介紹基本

工具來原幾個經典		問題. 若時間足	夠, 我還會談	談如何從 Kohr	n Laplacian 的	解出發,得到複
从旧江方						
*號為	為必填欄位					

## **Department of Mathematics**

Nieture of the course		Area 麻煩老師勾選類別,或直接填寫。				0	
Nature of the cou required	elective	代數與數論	分析 幾何	與拓樸	計算與應用數	學	
required	elective	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	ourse number		免填	Nur	mber of credits	3	
Course title	課程名稱:	課程名稱:大數據理論及實務應用					
Course title	Big Data App	Big Data Applications and Theories					
Instructor	教授:林大溢						

### \* Contents:

- 1.What is Big Data?
- 2.Google Tools and Big Data
- 3.TED and Big Data Cases
- 4.Big Data Research methods I
- 5.Big Data Research methods II
- 6. Taiwan Big Data sources and applications cases I
- 7. Taiwan Big Data applications cases II
- 8.USA Big Data applications cases I
- 9.USA Big Data applications cases II
- 10.USA Big Data applications cases III
- 11.UK Big Data applications cases
- 12. Japan Big Data applications cases
- 13. Australia Big Data applications cases
- 14. Global Business and industry applications cases
- 15.Big Data Challenges and Trends

### Course prerequisite:

### \*Reference material ( textbook(s) ) :

- Open Data Now: The Secret to Hot Startups, Smart Investing, Savvy Marketing, and Fast Innovation
- 2. All You Can Pay: How Companies Use Our Data to Empty Our Wallets(失控的大數據)
- 3. BUSINESS INTELLIGENCE AND ANALYTICS: FROM BIG DATA TO BIG IMPACT
- 4. Big Data: The Management Revolution, Andrew McAfee and Erik Brynjolfsson

## \* Grading scheme:

上台報告 40% , 期中報告 30% , 期末報告 30% , 總計 100%

## \*Course Goal:

To introduce students to know what and how about big data

- 1. \*號為必填欄位
- 2. 大綱內容字數英文最少 200 字以上

## Syllabus: Spring 2017

## 統計學習 (Statistical Learning)

#### **Textbook and Reference**

- Hastie T, Tibshirani R and Friedman J (2009). *The Elements of Statistical Learning, Data Mining, Inference and Prediction*. Springer, 2nd edition.
- James G, Witten D, Hastie T, Tibshirani R (2013). An Introduction to Statistical Learning with Applications in R. Springer.

### **Objectives**

This course will introduce various statistical techniques for extracting information from data. Students taking this course are expected to have a working knowledge of using these techniques in practice.

### **Course Outline**

- 1. Introduction & overview
- 2. Linear methods for regression
  - Linear regression
  - Classical model selection methods
  - Shrinkage methods, penalized regression
- 3. Linear methods for classification
  - Linear discriminant analysis
  - · Logistic regression
- 4. Nonparametric models
  - Basis expansion, regularization, splines
  - · Generalized additive models
- 5. Tree-based methods, ensemble methods
  - · Classification trees, regression trees, random forest
  - Multivariate adaptive regression splines
  - Boosting and bagging
- 6. Support vector machines
- 7. Unsupervised learning
  - Cluster analysis
  - · Principal component analysis

## **Course Prerequisites**

Introductory statistics, introductory probability theory, linear algebra, and some programming background in using R.

## Grading

- Homework (60%)
- Project (40%)

## 課程大綱調查表

				(中文)	數學軟體	
課	程	名	稱	(英文)	Mathematical Software	
課	程所属	屬 領	域	□ 代數	□分析 □幾何 □ 離散	
(	請勾	選	)	□ 統計	□機率或金融   ☑ 計算或應數	
課	程	規	劃	□ 學年調	Ę.	開課對象:☑大學部 (一年級以上)
# <b>7</b> *		選		☑ 學期課	₹ : □上學期 ☑下學期	☑研究生
(	明 勾	迭	)	上課時間	:	預估修課人數:
		•				

#### I. Contents:

本課程採用「做中學」以及「翻轉教室」的教學策略,透過多個實例單元以線上教學、講課、實作、討論與合作學習等方式進行教學。課程有下列三大主軸。

一、基本 MATLAB 程式語言(前半學期)

此部分將以翻轉教室的方法進行。主要目的是介紹 MATLAB 程式語言,以及如何使用 MATLAB 解決數學問題。

二、培養與精熟問題解決,演算法開發,與程式寫作等能力。(後半學期)

課堂中將進行數個學習單元,每個學習單元包含 (1) 動機問題鋪陳 (取材自科學、工程、生物、社會科學等應用),(2) 演算法發展與相關 MATLAB 語法,(3) 程式寫作與除錯,(4) 計算結果詮釋及其數學與科學意涵探究。

三、小組計畫(整學期)

主要目的是整合與應用課堂所學,增進跨領域的視野與理解,嘗試創新的思考,並培養規劃與實踐計畫

的能力。

#### II. Course Goal:

- 能理解動機問題
- 能對問題解決進行概念性的抽象思考,產生邏輯性的解決方案(演算法)
- 能將演算法具體化,以 MATLAB 實作程式
- 能透過除錯與數值實驗方式,將演算法與程式發展得更嚴謹與更有效率。
- 增進計算科學的基本素養(包含離散化、維度、趨近、資料視覺化、隨機、與複雜度)
- 透過程式與數學的交互作用,加強利用數值計算與幾何圖形進行推理的能力
- 能對科學,數學,電腦計算有跨領域的整體觀與思維
- 培養口語溝通與表達能力
- 培養合作、創造與寫作能力

### II. Course Prerequisite:

本課程不要求學生具備程式能力,但應有主動積極的學習態度。將用到部分微積分,線性代數。

### III. Reference Material (textbook(s)):

- [1] An Interactive Introduction to MATLAB (www.see.ed.ac.uk/teaching/courses/matlab/)
- [2] Data-Driven Modeling & Scientific Computation: Methods for Complex Systems and Big Data Paperback (2013), J. Nathan Kutz
- [3] Coding the Matrix: Linear Algebra through Applications to Computer Science Paperback (2013), Philip N. Klein
- [4] Insight Through Computing: A MATLAB Introduction to Computational Science and Engineering (2010), by Charles F. Van Loan and K.-Y. Daisy Fan.
- [5] "A Matlab Companion for Multivariable Calculus" by Jeffery Cooper. ISBN-13: 978-0121876258
- [6] MATLAB 程式設計 [入門篇], 張智星
- [7] Experiments with MATLAB, by Cleve Moler, 2009 (www.mathworks.com/moler/exm/index.html)
- [8] MATLAB Guide (2nd edition) by Desmond J. Higham and Nicholas J. Higham

## [9] 課堂中提供講義

IV. Grading Scheme:

課堂中作業 20%,小組學期作業 20%,期中考 30%,期末考 30%