國立政治大學商學院
COLLEGE OF COMMERCE
NATIONAL CHENGCHI UNIVERSITY

Stat 統計

Business Ethics
Globalization
Professionalism
Innovation
Impact
Engagement

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Contents

A.   Introduction to the College of Commerce

Introduction to the College of Commerce

The College of Commerce, National Chengchi University was established in 1958, and leads Taiwan in the development of advanced business administration programs with the best teachers and rigorous teaching and research spirit. It has cultivated elite talent for academic research and business administration with an equal emphasis on theory and practice, and has made significant contribution to the rapid development and transformation of Taiwan economy and society. The College of Commerce currently has eight departments and an independent graduate institute, three professional MBA programs and 16 college-level research centers. Key directions for future development include "FinTech and Innovation," "Innovation, Entrepreneurship, and Organizational Innovation," "Corporate Social Responsibility, Business Ethics, and Sustainable Development" and "IoT, Supply Chain, and e-Commerce Integration."

Elite Teachers

The College of Commerce currently has 151 full-time teachers, 90% of which have a Ph.D from a world class university. The outstanding research and academic performance of elite teachers have allowed numerous teachers to win academic research awards from the Ministry of Education (MOE) and the Ministry of Science and Technology (MOST), and hold important positions, such as the convener of a business related field under the MOST, or the editor-in-chief, vice editor-in-chief, and editor of a specific field, for TSSCI journals. Furthermore, many professors serve crucial roles in industry and government, including government officials, consultants, or committee members and company supervisors or directors.

Distinguished Alumni

Thanks to the rigorous professional training and cultivation by the College of Commerce, as well as the extraordinary performance of alumni in their professions, alumni of the College of Commerce have significant influence in industry, government, and academia. As a result, domestic industry has had a preference for graduates from the College of Commerce, including Chou Chun-Chi, Chairperson of Sinyi Realty Inc., Samuel Yin, Chairperson of Ruentex Financial Group, Song Wen-Chi, Former Chairperson of Taipei 101, Lin Hsin-I, Former Vice Premier, Lin I-Fu, Yin Chi-Ming, and Ho Mei-Yieh, Former Ministers of Economic Affairs, and Cheng Ting-Wang, Wu Si-Hua, and Edward Chow, Former Presidents of National Chengchi University are all alumni of the College of Commerce.

International Certification and Recognition

The College of Commerce, NCCU is the only college of commerce in Taiwan to pass all three international accreditations - AACSB, EUQIS, and AACSB Accounting. Only seven colleges of commerce worldwide have pass all three accreditations. This shows that the quality, learning resources, international development, and corporate cooperation of the College of Commerce, NCCU has widely gained international recognition. The College of Commerce became the 65th member of the Partnership in International Management (PIM) in October 2018. Members of the PIM include Cornell University Samuel Curtis Johnson Graduate School of Management, Imperial College Business, and National University of Singapore Business School, symbolizing that the level of internationalization at the College of Commerce, NCCU is on par with top tier colleges of commerce around the world.

Talent Cultivation and Industry-Academia Collaboration Project

The College of Commerce, NCCU closely works with the industrial sector and maintains good and close relationships with major corporations. This not only helps broaden students' horizons, but also gives them an opportunity to apply what they learned in practice. It utilizes industry resources in course design, so that courses are closer to practice, or transforms a company's experience into a case study, which helps improve teaching quality. Teachers can also apply the case studies in their research to create greater academic capabilities.

To increase the depth of industry-academia collaboration, the College of Commerce established the [Cross Elite Company Platform] in 2015. Linking together benchmark enterprises in different industries around Taiwan through a membership. The "Horizon Broadening Forum" held each quarter gives teachers and students an opportunity to engage in in-depth interactions with the industrial sector, so that students will have a better grasp of corporate practices, while building a stronger partnership between the College of Commerce, NCCU and different companies.

Innovation in Teaching

The College of Commerce adopted the assurance of learning (AOL) assessment method in coordination with the Association to Advance Collegiate Schools of Business (AACSB), in order to maintain elite levels of the international accreditation. The College strengthens students' core competencies, knowledge, and skills to ensure the learning effectiveness and quality assurance of higher education.

The College of Commerce, NCCU is always been a pioneer in the case study teaching method in Taiwan. It began to actively promote participatory teaching in 2005, and has selected over 50 seed instructors to participate in the Global Colloquium on Participant-Centered Learning (GloColl) in Harvard Business School. The College is promoting participatory teaching in courses, and hopes to inspire more creative ideas and diverse perspectives through active teacher-student interactions in class.

To train bilingual students with an expertise in international business administration, the College of Commerce, NCCU offered the first English Taught Program (ETP) in Taiwan in 2000. In response to trends and society's needs, the College offered numerous programs, such as the Supply Chain Management Credit Program, Big Data Analysis Program, and FinTech Expertise Program, to help cultivate experts in different fields for society.

International Exchange

The College of Commerce, NCCU has exerted great efforts in different aspects of internationalization, and established the Office of International Affairs in 1999 to actively promote international cooperation and exchange. At present, the College has 139 sister schools and recommends or is recommended over 500 exchange students from foreign universities every year. The College launched five dual degree programs with Purdue University in 2019, including IMBA, MBA, master's programs of the Department of Accounting and Department of Management Information Systems, and the Department of Finance.

The College is also actively promoting international academic exchange, and co-organizes international conferences with renowned universities in the Asia-Pacific, such as the Chinese University of Hong Kong and Nanyang Technological University. The College is also frequently visited by famous professors and journal editors from overseas. The College began co-organizing the "Cross-Strait Business School Academic Forum" with Sun Yat-Sen Business School, Renmin Business School, and Xiamen University School of Management in 2018. The four schools take turns hosting the forum, which will benefit long-term partnerships between the College and international academic institutions.

B.   Introduction to the Department of Statistics

Established in 1958, the Department of Statistics was formerly the Department of Accounting and Statistics. In response to the market demand on statistics talent, the Department of Statistics became an independent department under the College of Commerce in 1966. The Department subsequently established the first master's program in statistics in Taiwan in 1968. It further established a doctoral program in statistics in 1988, becoming the first department in Taiwan to provide complete statistics education.

In coordination with the Ministry of Education's policy to merge departments and graduate institutes in 1995, the Department of Statistics and Graduate Institute of Statistics were merged and formally named the Department of Statistics (includes an undergraduate program, master's program, and doctoral program). The Department currently has 14 full-time teachers; 2 adjunct teachers; 2 administrative assistants; 235 students in the undergraduate program; 65 students in the master's program, and 6 students in the doctoral program.

The Department's curriculum planning gives consideration to both theory and practice, and designed consistent courses throughout the undergraduate program, master's program, and doctoral program. The Department also established statistics-related research centers to provide students with opportunities for actual operations, and also provide statistics services needed by the government, academia, and industry. This also increases interactions and exchanges between the Department's teachers and students with different sectors. The Department currently has a Statistics Consulting Center, which is headed by a full-time teacher of the Department in principle, and graduate students of the Department serve as assistants at the Center to handle various projects.

I.   Teaching Goals:

The Department's teaching goals focus on the integration of theory and practical applications, and each professional course on applications not only introduces methodology, but also provides training in statistics software applications and operations, in hopes of training students' independent problem solving abilities. Furthermore, visits to government agencies, major corporations, and survey centers gives students an early understanding of how the government and corporations operate in practice. From the perspective of master's and doctoral programs, the establishment of the Department's Statistics Consulting Center provides students with an opportunity to participate in practical cases through the statistics consulting, sampling survey, and data analysis services provided to internal and external organizations. Students can further learn and understand how to fully utilize what they learned, allow their theoretical foundation and practical experience to complement each other, and meet the needs of society.

II.   Features:

The Department has the most complete statistics education system in Taiwan (undergraduate/master's/doctoral programs). It also has a well planned statistics consulting office and telephone interview classroom for students to intern. The Department features teaching that focuses on basic training in statistics education and practical applications, complete teaching facilities, courses that students may be flexibly and freely choose, and smooth communication channels between teachers and students.

III.   Development:

To achieve the Department's educational objective to cultivate professional statistics talent, and

also provide professional statistics services to different sectors. The Department's teaching always combines theory and application. Furthermore, in response to changes in the environment, especially a digital era with information explosion, the Department focuses on increasing students familiarity with statistics package software, and also uses practical cases in hopes of cultivating statistics talent with professional competencies.

To achieve the teaching feature of equal emphasis on theory and practice, the Department established the Statistics Consulting Center and its curriculum planning is also carried out on this basis, so that students can have training and abilities in this area when they graduate. Furthermore, besides cultivating professional statistics talent, the Department also hopes to develop students' independent thinking and problem solving abilities, so that they will gain the two abilities in their study process. The College of Commerce has an abundance of resources, including 8 departments and 1 graduate institute, is AACSB accredited, and is a member of EQUIS. In an era of interdisciplinary knowledge integration, the College of Commerce provides the Department's students with professional knowledge in commerce, and increases their employment opportunities. Therefore, the Department not only encourages students to absorb commerce-related knowledge and increases professional training in statistics applications, but also encourages students to take university-level and college-level credit programs in business administration. The Department is currently responsible for curriculum planning and issuing study certificates for the Mathematical Finance Credit Program of the undergraduate program. So far over 500 individuals have obtained the program's certificate, in which over 320 are the Department's students. In response to needs of the big data era, the Department collaborated with the Department of Management Information Systems, College of Commerce and Department of Computer Science, College of Science in establishing the Big Data Analysis Program. The Department is responsible for study applications and certificate issuance for the program, which was offered starting in academic year 2014, and 2 individuals have obtained the program's certificate. After receiving professional training in statistics and taking other professional courses in business administration, the Department's alumni working in the financial industry have gradually increased, reaching 50% and higher in the past five years.

IV. Overview of the Department's Statistics Consulting Center:

The Statistics Consulting Center was established in 1995, and members include a director, deputy director, and executive assistants. Experts and scholars inside and outside the university are hired as consultants for the Center.

The Center is located on the eleventh floor of the College of Commerce, and the director and deputy director are responsible for the statistics consulting process and manpower allocation. Data collection and analysis operations are mainly carried out by graduate students of the Department. In principle, 5-7 master's and doctoral students are responsible for routine consulting work. Others tasks (such as: data input and sorting) are carried out by the Department's undergraduate or master's students.

The Center was established with the purpose of promoting statistics related affairs, in which statistics consulting is the main appeal. The Center hopes to help the government, academia, and various sectors correctly define problems, adopt the appropriate data collection and analysis method, and further improve the quality of decisions. The scope of consulting services includes market survey, product development, insurance, human resources, and statistics education. On average over 10 analysis cases related to questionnaire surveys are received each semester.

C. Department of Statistics Doctoral Program
I. Introduction to Courses
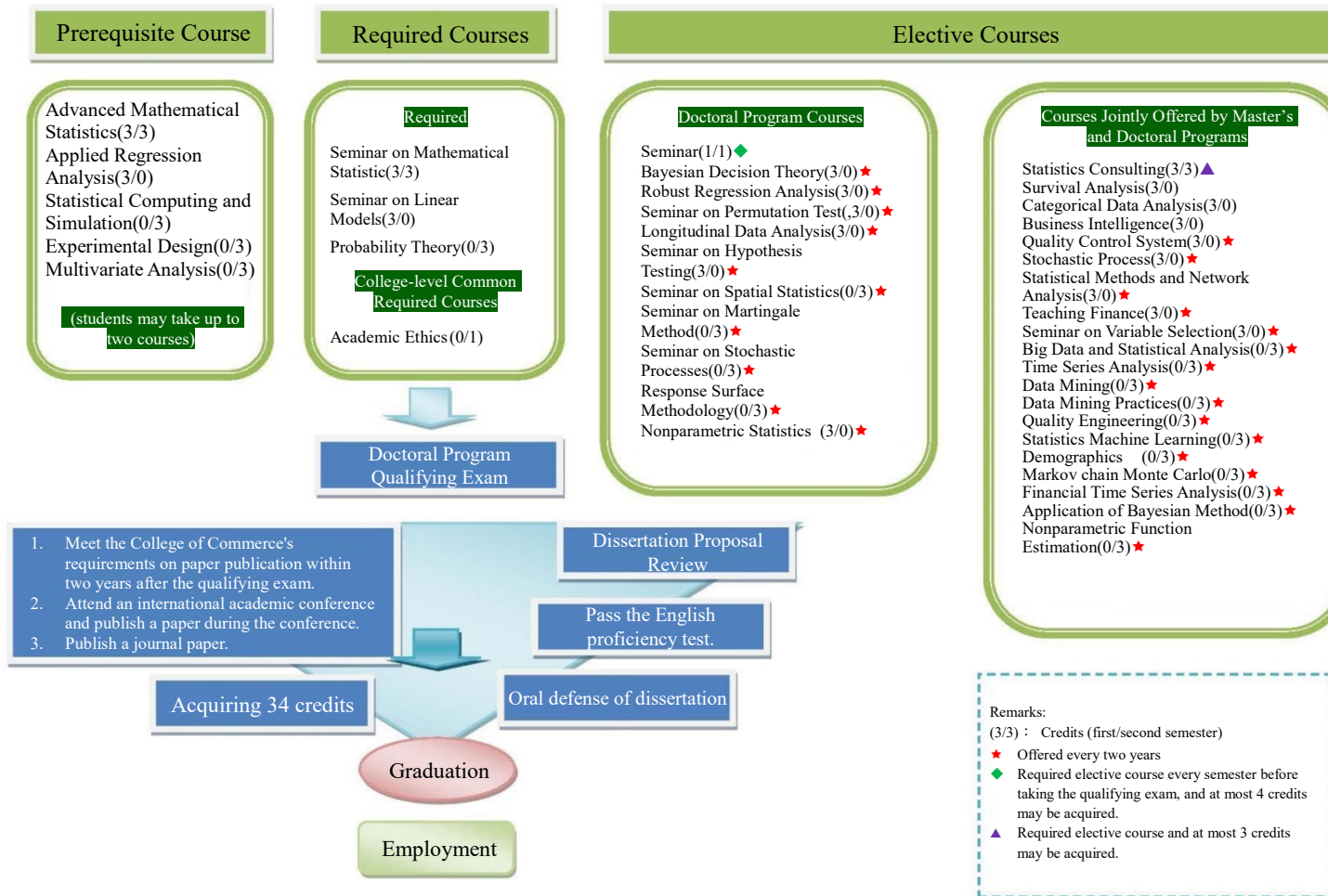### (I) Educational Objectives and Core Competences

Core Competency Index for the Ph.D. Students of the <u>Department of Statistics</u>

Educational Purpose	Core Competency	Core Competency weight	quantitative analytical skills	logical and analytical thinking	professional knowledge	strategic thinking	critical thinking	prompt reasoning	flexible reaction and adaptability	creativity	persistence	communication skill	effective listening skills	sympathy	teamwork	ability to accept constructive criticism	confidence	Self –Management
To cultivate statistical professionals with respect to educational and research development ● To construct high-level statistical understanding ● To foster the ability to develop statistical theories ● To create innovative statistical methods ● To promote ideas and theories in the field of statistics ● To develop teaching ability, communication skills, and knowledge of professional ethics.	To equip with of high-level mathematical abilities	**25%**	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨					∨	∨
	To equip with knowledge of professional ethics	**10%**	∨	∨	∨	∨	∨	∨	∨	∨	∨						∨	∨
	To innovate statistical methods and methodology, and to develop statistical theories	**45%**	∨	∨	∨	∨	∨	∨	∨	∨	∨						∨	∨
	To equip with abilities in statistical consulting	**10%**	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨
	To equip with teaching capability and communication skills, interdisciplinary competence and teamwork abilities	**10%** **Total：100%**	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨	∨

(II) Curriculum Map

Department of Statistics Doctoral Program Curriculum Map

(Applicable to students enrolled from academic year 2020)

Prerequisite Course	Required Courses	Elective Courses

Prerequisite Course

Advanced Mathematical Statistics(3/3)
Applied Regression Analysis(3/0)
Statistical Computing and Simulation(0/3)
Experimental Design(0/3)
Multivariate Analysis(0/3)

(students may take up to two courses)

Required Courses

Required

Seminar on Mathematical Statistic(3/3)

Seminar on Linear Models(3/0)

Probability Theory(0/3)

College-level Common Required Courses

Academic Ethics(0/1)

↓

Doctoral Program Qualifying Exam

Elective Courses

Doctoral Program Courses

Seminar(1/1)◆
Bayesian Decision Theory(3/0)★
Robust Regression Analysis(3/0)★
Seminar on Permutation Test(,3/0)★
Longitudinal Data Analysis(3/0)★
Seminar on Hypothesis Testing(3/0)★
Seminar on Spatial Statistics(0/3)★
Seminar on Martingale Method(0/3)★
Seminar on Stochastic Processes(0/3)★
Response Surface Methodology(0/3)★
Nonparametric Statistics (3/0)★

Courses Jointly Offered by Master's and Doctoral Programs

Statistics Consulting(3/3)▲
Survival Analysis(3/0)
Categorical Data Analysis(3/0)
Business Intelligence(3/0)
Quality Control System(3/0)★
Stochastic Process(3/0)★
Statistical Methods and Network Analysis(3/0)★
Teaching Finance(3/0)★
Seminar on Variable Selection(3/0)★
Big Data and Statistical Analysis(0/3)★
Time Series Analysis(0/3)★
Data Mining(0/3)★
Data Mining Practices(0/3)★
Quality Engineering(0/3)★
Statistics Machine Learning(0/3)★
Demographics   (0/3)★
Markov chain Monte Carlo(0/3)★
Financial Time Series Analysis(0/3)★
Application of Bayesian Method(0/3)★
Nonparametric Function Estimation(0/3)★

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1. Meet the College of Commerce's requirements on paper publication within two years after the qualifying exam.
2. Attend an international academic conference and publish a paper during the conference.
3. Publish a journal paper.

Dissertation Proposal Review

Pass the English proficiency test.

Acquiring 34 credits

Oral defense of dissertation

Graduation

Employment

Remarks:
(3/3)： Credits (first/second semester)
★ Offered every two years
◆ Required elective course every semester before taking the qualifying exam, and at most 4 credits may be acquired.
▲ Required elective course and at most 3 credits may be acquired.

II. Graduation requirements

Graduation credits	34
Prerequisite Course	Upon the reception of admission to the PhD program, students may be asked to take some designated and fundamental courses in the Master's program. In principle, this needs to be done before taking the qualifying exam.
Required Courses	Seminar on Mathematical Statistics, Seminar on Linear Models, Probability Theory, Academic Ethics (13 credits in total).
Required Elective Courses	Seminar, Statistics Consulting (7 credits in total)
Elective Courses	14 credits
Qualifying Exam	1. Complete graduation credits (34 credits). 2. Pass the qualifying exam. 3. Meet the College of Commerce's requirements on paper publication within two years after the qualifying exam. 4. Pass the dissertation proposal review. 5. Attend an international academic conference and publish a paper during the conference. 6. Number of academic papers published meets requirements. 7. Pass the English proficiency test standard. 8. Pass the degree examination.

III. Curriculum Planning (for PhD students who have done all prerequisite courses)

First semester of first year					Second semester of first year				
Course ID	Course Name	Class time (Temporary)	Credits	Estimated learning time outside of class each week	Course ID	Course Name	Class time (Temporary)	Credits	Estimated learning time outside of class each week
354003001	※△ Seminar on Mathematical Statistics		3	3-6 hours	354003002	※△ Seminar on Mathematical Statistics		3	3-6 hours
354015001	※ Seminar on Linear Models		3	5 hours	354016001	※Theory of Probability		3	5 hours
354715001	◎Seminar	Wednesday,1	1	1 hour	300006011	※Academic Ethics	Friday, FGH	1	3 hours
354714001	◎Statistics Consulting	Wednesday, 234	3	5-10 hours	354715001	◎Seminar	Wednesday, 1	1	1 hour
354712001	◎Nonparametric Function Estimation	Wednesday, 234	3	4-5 hours	354714001	◎Statistics Consulting	Wednesday, 234	3	5-10 hours
354790001	◎Categorical Data Analysis	Tuesday, D56	3	4-5 hours	354734001	◎Business Intelligence	Thursday, D56	3	3 hours
354921001	◎Big Data and Statistical Analysis	Tuesday, 234	3	5-10 hours					
354923001	◎Applied Bayesian Methods	Thursday,234	3	4-5 hours					

※Required Courses   ◎Elective Courses   V Group courses   △Two-Semester Course

Note: The actual class schedule shall be based on the announcement by the Curriculum Section, Office of Academic Affairs.

First semester of second year					Second semester of second year				
Course ID	Course Name	Class time (Temporary)	Credits	Estimated learning time outside of class each week	Course ID	Course Name	Class time (Temporary)	Credits	Estimated learning time outside of class each week
354715001	◎Seminar	Wednesday, 1	1	1 hour	354715001	◎Seminar	Wednesday, 1	1	1 hour
354714001	◎Statistics Consulting	Wednesday, 234	3	5-10 hours	354714001	◎Statistics Consulting	Wednesday, 234	3	5-10 hours
354712001	◎Nonparametric Function Estimation	Wednesday, 234	3	4-5 hours	354734001	◎Business Intelligence	Thursday, D56	3	3 hours
354742001	◎Advance Quality management	Tuesday, 234	3	4-5 hours					
354790001	◎Categorical Data Analysis	Tuesday, D56	3	4-5 hours					
354921001	◎Big Data and Statistical Analysis	Tuesday, 234	3	5-10 hours					
354923001	◎Applied Bayesian Methods	Thursday, 234	3	4-5 hours					
Prepare for the qualifying exam					Prepare for the qualifying exam				

※Required Courses　◎Elective Courses　　V Group courses　　△Two-Semester Course
Note: The actual class schedule shall be based on the announcement by the Curriculum Section, Office of Academic Affairs.

First semester of third year					Second semester of third year				
Course ID	Course Name	Class time (Temporary)	Credits	Estimated learning time outside of class each week	Course ID	Course Name	Class time (Temporary)	Credits	Estimated learning time outside of class each week
354714001	◎Statistics Consulting	Wednesday, 234	3	5-10 hours					
Prepare for the qualifying exam					Prepare for the qualifying exam				

※Required Courses　　◎Elective Courses　　V Group courses　　△Two-Semester Course
Note: The actual class schedule shall be based on the announcement by the Curriculum Section, Office of Academic Affairs.

Semester of fourth year					Second semester of fourth year				
Course ID	Course Name	Class time (Temporary)	Credits	Estimated learning time outside of class each week	Course ID	Course Name	Class time (Temporary)	Credits	Estimated learning time outside of class each week
Write the dissertation, oral defense of the dissertation proposal, doctoral degree examination.				No limit	Write the dissertation, oral defense of the dissertation proposal, doctoral degree examination.				No limit

※Required Courses　　◎Elective Courses　　V Group courses　　△Two-Semester Course
Note: The actual class schedule shall be based on the announcement by the Curriculum Section, Office of Academic Affairs.

IV. Overview of Courses (for PhD students who have done all prerequisite courses)

354003001	Seminar on Mathematical Statistics (Required)	3 credits	First year doctoral students	3 hours
[Course Objectives]	This is a two semester course that introduces statistical methods from a theoretical perspective. This course aims to train students to use strict mathematical methods for theory derivation, and develop theoretical results needed for future research			
[Course Contents]	Includes review of probability theory, large sample theory, introduction to decision theory, Bayesian decision, minimax method, and unbiased estimation.			
[Remarks]	Estimated learning time outside of class each week: 3-6 hours			

354003002	Seminar on Mathematical Statistics (Required)	3 credits	First year doctoral students	3 hours
[Course Objectives]	This is a two semester course that introduces statistical methods from a theoretical perspective. This course aims to train students to use strict mathematical methods for theory derivation, and develop theoretical results needed for future research			
[Course Contents]	Introduces theoretical results of hypothesis testing, including UMP/UMPU/UMPI tests, and tests based on the maximum likelihood function.			
[Remarks]	Estimated learning time outside of class each week: 3-6 hours			

354015001	Seminar on Linear Models (Required)	3 credits	First year doctoral students	3 hours
[Course Objectives]	The objective of this one-year course is to provide a unified approach to tie up between linear statistical models. A careful theoretical training will be given to furnish students the power of developing the properties of any new proposed methodologies.			
[Course Contents]	Topics include Projection Operators, Distribution of Quadratic Forms, Gauss-Markov Theorem, Analysis of Variance Models, Miscellaneous of Other Models, Specification Error, Effects of Additional or Fewer Explanatory Variables or Observations.			
[Remarks]	Estimated learning time outside of class each week: 5 hours			

354016001	Theory of Probability (Required)	3 credits	First year doctoral students	3 hours
[Course Objectives]	Students will be trained in a mathematically rigorous fashion and are expected to develop the ability of deriving theoretical results for their future research after completing this course.			
[Course Contents]	These topics are in Sections 2,3,4,5,10,11,13,15,16,18-21,32-34 in Billingsley's text. 1.Extension of measure, σ-felds and other classes of sets 2.Extension of measure, limits of sets, Borel-Cantelli lemmas 3.Measurable functions 4.Integration, uniform integrability 5.Radon-Nykodim Theorem, modes of convergence 6.Inequalities 7.Conditional expectation, product measures, Fubini's theorem			
[Remarks]	Estimated learning time outside of class each week: 5 hours			

300006011	**Academic Ethics (Required)**	1 credit	College of Commerce Ph.D	
[Course Objectives]	By teaching business ethics concepts and academic ethics principles, this course aims to cultivate academic talent with the ability to determine value, and attaches importance to the spirit of business ethics and principles of research ethics. As a result, doctoral students will be able to implement ethical concepts in their field of expertise when they become teachers of business administration in the future. It will strengthen the elements of business ethics in teaching contents and cause the students to uphold academic ethics when engaging in research.			
[Course Contents]	Contents of this course cover two aspects: Business ethics and academic ethics. Aspects of business ethics include ethical dialectical training, introduction to theories of ethics, business ethics case analysis and discussion, and sustainability activities. Academic ethics includes guidelines for writing academic papers and citation and quotation, principles and procedures for reviewing research ethics in social sciences, and application for and regulations on MOST projects.			
[Remarks]	Estimated learning time outside of class each week: 3 hours			

354715001	**Seminar (Required Elective)**	1 credit	First year doctoral students and above (inclusive)	1 hour
[Course Objectives]	This course will invite scholars to visit our department and share their professional knowledge with our faculty members and graduate students. An academic presentation is given by the invited scholar, while all graduate students are required to sit in the presentation and interact with the speaker. The goal is to provide our graduate students opportunities for participating academic activities, enhance the broad view of academic research, improve their presentation skill, and share their professional knowledge with colleagues.			
[Course Contents]	Introduction Invited talks/presentations Q&A Student presentation			
[Remarks]	Estimated learning time outside of class each week: 1 hour. Doctoral students must take 4 credits in total			

354714001	**Statistics Consulting (Required Elective)**	3 credits	Second year master's students, first year and second year doctoral students and above (inclusive)	3 hours
[Course Objectives]	The goal is to develop the skills needed by a statistical consultant. Emphasized topics include data analysis, problem solving, report writing, oral communication with clients, issues in planning experiments and collecting data, and practical aspects of consulting management.			
[Course Contents]	For the mid-term report, the students will have a face-to-face interview with real client and define the problem according to the contact with the client, following by a formal written report. A final (major) project consists of an actual consulting experience for each student with a required oral presentation and written report. [See the Project page for more detail.] In addition there are a number of short written reports and in-class discussion assignments on a variety of topics. These include brief write-ups on more "minor" data analyses. There are some assigned readings as well as videotape viewings.			

	The majority of the work load occurs in the first 2/3 of the course.
[Remarks]	Estimated learning time outside of class each week: 5-10 hours

354712001	**Nonparametric Function Estimation (Elective)**	3 credits	master's students, doctoral students	3 hours
[Course Objectives]	Basic methods for nonparametric function estimation will be introduced and students will be asked to complete in-class assignments that involves writing R codes to implement the methods taught in class. The main objective of this course is to help students develop basic understanding of concepts and methods in nonparametric function estimation. Expected learning outcomes: students are expected to know how to implement the method learned in class using R after completing this course.			
[Course Contents]	1.Introduction to nonparametric function estimation 2.Kernel regression 3.Evaluation via IMSE 4.Function approximation using basis functions 5.B-splines 6.Kernel density estimation and cross-validation 7.Spline density estimation 8.Application to logistic regression 9.Multivariate estimation using kernel method 10.Multivariate estimation using tensor product basis			
[Remarks]	Estimated learning time outside of class each week: 4~5 hours			

354712001	**Advance Quality management (Elective)**	3 credits	master's students, doctoral students	3 hours
[Course Objectives]	The goal of this course is to introduce to graduate students advanced concept, theory and methodology in quality control so as to enhance their abilities for solving complex, novel and practical problems in related areas. In addition, some important research topics and trends will be discussed so as to provide innovative thinking in quality control.			
[Course Contents]	This course introduces the rationale and theory of how to develop a control chart for monitoring and detecting irregular signals in industry, including mainly the design of of EWMA control charts for monitoring the mean and variance, enhancing the efficiency of monitoring for time-dependent data, profile monitoring, nonparametric control charts, loss-function and multivariate control charts. A final report (including oral presentation) is necessary.			
[Remarks]	Estimated learning time outside of class each week: 4~5 hours			

354790001	**Categorical Data Analysis (Elective)**	3 credits	master's students, doctoral students	3 hours
[Course Objectives]	*To introduce basic concepts and common statistical models and analyses for categorical data and to provide enough theory, examples of applications, and practice using categorical techniques so that students can use these methods in their own research. *The focus is on applications of the techniques and interpretations of results.			
[Course Contents]	Introduction Two-Way Contingency Tables Three-Way Contingency Tables Generalized Linear Models			

Logistic Regression
Building and Applying Logistic Regression Models
Multicategory Logit Models
Loglinear Models for Contingency Tables

| [Remarks] | Estimated learning time outside of class each week: 3 hours |

354921001	Big Data and Statistical Analysis (Elective)	3 credits	master's students, doctoral students	3 hours
[Course Objectives]	The goal is to develop the skills required for a data scientist in the statistical point of view. Emphasized topics include problem definition, data analysis for hard and soft data (or structured vs. unstructured data), data cleaning, and practical aspects of big data analysis.			
[Course Contents]	For the first part of semester, we will introduce some basic notions of big data, as well as problem definition. The second and third parts involve case studies of hard and soft data, in addition to the introduction of their analysis methods. Basically, the analysis of hard data includes the data mining techniques (Hastie et al., 2009). On the other hand, since there is no standard operating procedure for the soft data yet, we suggest using the exploratory data analysis for preliminary data analysis. Also, the use of computer software SQL and R is required in this course. The software R can be downloaded via http://www.r-project.org.			
[Remarks]	Estimated learning time outside of class each week: 5~10 hours			

354923001	Applied Bayesian Methods (Elective)	3 credits	master's students, doctoral students	3 hours
[Course Objectives]	This course presents general Bayesian principles and Bayesian computation techniques. It will cover empirical Bayes methods, Bayesian hierarchical models, Markov Chain Monte Carlo methods, and selected topics from Bayesian machine learning. Upon successful completion students should be able to formulate Bayesian models and use statistical software for data analysis.			
[Course Contents]	1.Introduction to Bayesian inference 2.Empirical Bayes vs fully Bayes 3.Introduction to Markov Chain 4.Markov Chain Monte Carlo and Gibbs sampling 5.MCMC for linear regression 6.MCMC for logistic regression 7.Convergence diagnosis and other issues 8.MCMC for hierarchical normal models 9.Bayesian mixture models and Gibbs sampler 10.Naive Bayes vs logistic regression 11.Bayesian model selection			
[Remarks]	Estimated learning time outside of class each week: 4~5 hours			

354734001	Business Intelligence (Elective)	3 credits	master's students, doctoral students	3 hours
[Course Objectives]	The course deals with a collection of computer technologies that support managerial decision making by providing information on internal and external aspects of operations.			
[Course Contents]	The topics include data warehousing, business performance management, data mining, text and web mining and business implementation.			
[Remarks]	Estimated learning time outside of class each week: 3 hours			

V. Course Checklist and Study Plan:

(I) Course Checklist:

College of Commerce, National Chengchi University
Department of Statistics Doctoral Program (34 graduation credits)

Name:_____

Student No.:_____

College-level elective courses (1 credit)				Elective Courses in the Department			
Course Name	**Credits**	**Score**	**Remarks**	**Course Name**	**Credits**	**Score**	**Remarks**
Academic Ethics	1	_____	☐	1. _____	____	____	☐
Department-level elective courses (12 credit)				2. _____	____	____	☐
Course Name	**Credits**	**Score**	**Remarks**	3. _____	____	____	☐
Seminar on Mathematical Statistics	3/3	_____	☐	4. _____	____	____	☐
Seminar on Linear Models	3	_____	☐	5. _____	____	____	☐
Probability Theory	3	_____	☐	6. _____	____	____	☐
Department-level elective courses (7 credit)				**Elective courses of other departments**			
Course Name	**Credits**	**Score**	**Remarks**	**Course Name**	**Credits**	**Score**	**Remarks**
Seminar	1/1	_____	☐	1. _____	____	____	☐
Seminar	1/1	_____	☐	2. _____	____	____	☐
Statistics Consulting	3	_____	☐	3. _____	____	____	☐
				4. _____	____	____	☐
				5. _____	____	____	☐
				6. _____	____	____	☐

Total credits: <u>34 credits</u>

(II) Study Plan:

National Chengchi University Department of Statistics Study Plan

Graduate Institute - Doctoral Program (Contents of the table may be added or deleted as needed)

Name: _____   Student No.: _____

First Semester of Academic Year _____				Second Semester of Academic Year _____			
Course Name	Class time	Required/ Elective	Semester Credits	Course Name	Class time	Required/ Elective	Semester Credits
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
		Required ☐				Required ☐	
		Elective ☐				Elective ☐	
Total:							

D. Department of Statistics Faculty Members

Name	Title	Highest degree	Expertise	Department
Liu Hui-Mei	Professor	Ph.D in Statistics, North Carolina State University	Tests for Hypotheses about Linear Inequalities, Multivariate Analysis, Application of Importance Sampling	Department of Statistics
Yang Su-Fen	Professor	Ph.D in Statistics, University of California, Riverside	Industrial Statistics, Probability Models	Department of Statistics
Yue Ching-Syang	Professor	Ph.D in Statistics, University of Wisconsin-Madison	Statistical Computing, Demographics, Game Theory, Spatial Statistics	Department of Statistics
Weng Chiu-Hsing	Professor	Ph.D in Statistics, University of Michigan	Time Series, Bayesian Analysis, Statistical Learning, Sequential Analysis	Department of Statistics
Cheng Tsung-Chi	Professor	Ph.D in Statistics, London School of Economics and Political Science	Robust Regression Diagnostics, Longitudinal Data Analysis, Categorical Data Analysis	Department of Statistics
Hsueh Huey-Miin	Professor and Dean of Student Affairs	Ph.D in Statistics, National Central University	Biostatistics, Measurement Error Analysis	Department of Statistics
Hung Ying-Chao	Professor	Ph.D in Statistics, University of Michigan	Applied Probability, Computational Statistics	Department of Statistics
Jeng Tian-Tzer	Associate Professor and Director of the Statistics Consulting Center	Ph.D in Statistics, Ohio State University	Time Series Analysis, Inferential Statistics, Sampling Method	Department of Statistics
Chiang Jeng-Tung	Associate Professor	Ph.D in Statistics, Pennsylvania State University	Linear Models, Categorical Data Analysis	Department of Statistics
Chen Li-Shya	Associate Professor and Head of the Extracurricular Section	Ph.D in Statistics, University of Minnesota	Bayesian Analysis, Survival Analysis, Structural Equation Modeling	Department of Statistics
Cheng	Associate	Ph.D in Statistics, University	Sampling Methods,	Department of

Name	Title	Highest degree	Expertise	Department
Yu-Ting	Professor	of Minnesota	Data Mining, Multivariate Analysis, Market Survey, Business Intelligence	Statistics
Huang Tzee-Ming	Associate Professor and Chair of the Department of Statistics	Ph.D in Statistics, Carnegie Mellon University	Nonparametric Bayesian Inference	Department of Statistics
Huang Chia-Hui	Associate Professor	Ph.D in Statistics, Columbia University	Biostatistics and its Applications	Department of Statistics
Chou Pei-Ting	Assistant Professor	Ph.D in Statistics, University of California, Davis	Statistics Machine Learning, Biostatistics, Longitudinal Data Analysis	Department of Statistics