Doctor of Philosophy Program in Applied Statistics
(International Program)
Revised Program 2017

Name of Institution National Institute of Development Administration
Responsible Agency Graduate School of Applied Statistics

Section 1. General Information

1. Program Title

Program Title in Thai: หลักสูตรปรัชญาดุษฎีบัณฑิต สาขาวิชาสถิติประยุกต์ (หลักสูตรนานาชาติ)

Program Title in English: Doctor of Philosophy Program in Applied Statistics (International Program)

2. Degree Title

Full Name: ปรัชญาดุษฎีบัณฑิต (สถิติประยุกต์)
Doctor of Philosophy (Applied Statistics)

Abbreviated Name: ปร.ด. (สถิติประยุกต์)
Ph.D. (Applied Statistics)

3. Major Subject

3.1 Statistics
3.2 Actuarial Science and Quantitative Risk Management
3.3 Business Analytics and Intelligence
3.4 Industrial Statistics, Operations Research, and Logistic Systems
3.5 Population and Policy Research Methods for Development

4. Credit Requirements for Program Completion

Plan 1 (1.1)	48 credits
Plan 2 (2.1)	60 credits

5. Program Formats

5.1 Format: Doctorate degree according to the standard of higher education program
5.2 Medium of Instruction: English
5.3 Students Admissions: Open for Thai and international graduates
5.4 Cooperation with Other Institutes: Direct teaching program only by the institute with collaboration agreements with other national and international academic institutes and universities
5.5 Award of the Degree: One degree will be provided for one major

6. Conditions of the Program and the Approval of the Program

- Revised Program 2017
- The program will be in use from the First semester of academic year 2017
- Committee of the Academic Council authorized / approved the curriculum at its 1/2017 meeting on 21 February 2017.
- The Council of the National Institute of Development Administration authorized / approved the curriculum at its 3/2017 meeting on 15 March 2017.

7. Provision Time Frame for Quality and Standard Controls of the Program

The program is prepared in accordance with published standards of the AUN-QA.

8. Graduate Employment Opportunities

8.1 Professors in various disciplines including business administration, mathematics, statistics, research methodology, actuarial sciences and risk management, and operations research in educational institutions

8.2 Researchers / Scholars / Statistical Analysts

8.3 Business analysts, Business Planners, Strategists, Business consultants

8.4 Statisticians/Data Scientists/Data Modelers

8.5 Actuaries/Risk Managers

8.6 Operations/Production managers/planners

8.7 Start ups and Enterpreneurs

8.8 Executives

9. Name, Surname, Personal Number and Educational Qualification of the Instructors Responsible for the Curriculum

Name-Family Name	ID Card Number	Academic Degrees	Institutes of Attainment
Prof.Dr. Samruam Chongcharoen	xxxxxxxxxxxx	Ph.D. (Statistics)	University of Missouri-Columbia, U.S.A. (1998)
		M.A. (Mathematics Actuarial Science)	Central Connecticut State University, U.S.A. (1994)
		M.S. (Applied Statistics)	National Institute of Development Administration, Thailand. (1984)
		B.Ed.(Mathematics)	Srinakharinwirot University at Phitsanulok, Thailand. (1981)
Assoc.Prof.Dr.Duanpen Teerawanviwat	xxxxxxxxxxxx	Ph.D. (Sociology)	University of Hawaii (Manoa), U.S.A. (1989)
		M.A. (Sociology)	University of Florida, U.S.A. (1981)
		M.Ed. (Educational Research)	Chulalongkorn University, Thailand. (1976)
		B.Ed. 2nd Class Hons	Chulalongkorn University, Thailand. (1974)

Name-Family Name	ID Card Number	Academic Degrees	Institutes of Attainment
Assist.Prof.Dr. Preecha	xxxxxxxxxxxx	Ph.D. (Management	Asian Institute of

Vichitthamaros		of Technology)	Technology, Thailand. (2002)
		MBA (Management of Technology)	Asian Institute of Technology, Thailand. (1995)
		M.S.(Statistics)	Chulalongkorn University. (1991)
		B.Sc. 2nd Class Hons.	Chulalongkorn University. (1989)

10. Program Facilities

All teaching courses will be held at the Nationa Institute of Development Administration. (Graduate School of Applied Statistics, National Institute of Development Administration, 118 Seri Thai Road, Klongjan, Bangkapi, Bangkok, Thailand 10240. Telephone: 02-7273037-3040

11. External Factors on Program Planning

11.1 Situations or Economic Development

The advent and advancement of information technology bring the current world into big data era such that data are high in their variety, volume, and velocity. Such rapid changes intensify the need to pre-process, process, and analyze big data into information and intelligence and then ultimately convert information and intelligence into competitive advantage and actionable plans which eventually contribute social, economic, and national development in a long-run.

Especially, Thailand has confronted middle income trap that hinder our national development. Hence, we strongly need to transform data into information and intelligence as a part of value creation process to build up competitive advantage such that we can create knowledge-based economy and leave away from the labour-intensive or capital intensive economy.

This curriculum aims at developing Ph.D. graduate with 21st century skills with strong research and statistical methodology and skills, information technology skills, and inquiry skills so that they can apply, analyze, solve, and provide better solutions for business, finance, insurance, logistics, industry, society, economic, and national problems to achieve sustainable development.

11.2 Situation or Social and Cultural Development

Integration between multidiscliplinary and technology fusion in the current world leads to social and economic innovation. Such changes make it harder for graduates who acquire solely acquire knowledge in any single discipline to compete and succeed. This curriculum has

been improved by harmonizing and integrating between several disciplines to align with frontier of knowledge and state-of-the art practices.

12. Impact from 1 1 on the Program Development in Relation to the Institution's Obligation

12.1 Program Development

From the impact of external situations above, the objectives of program development is to produce researchers, scholars, professors, specialists and consultants with capability to synthesize theories for building new knowledge, to transfer knowledge, to analyze complicated problems. These products must have potential in self-development in their job both in the aspects of academic and professional with morality and ethics. These characteristics are reflected in various courses of the program.

Moreover, the integration and convergence among discipline are the key factors in the current world of work as well as the advent of big data and data sciences. Hence, the curriculum and major have been revised tremendously to reflect those trends and situations.

Business analytics and research major has been revised to Business analytics and intelligence to reflect the integration between applied statistics and information technology as well as to align with current practice in the field of business analytics and intelligence and data sciences.

Quantitative risk management major has been changed to actuarial sciences and quantitative risk management since these two disciplines must be applied concurrently in the real world settings.

Operations research major has been changed to industrial statistics, operations Research, and logistic systems in order to reflect the applications and convergence among these three disciplines.

Population and development major is radically revised and converted into population and policy research methods for development since only demography is not sufficient to solve social and national problem, but public policy, evaluation methods, and research methodology must be integrated to solve them.

12.2 The Connection with the Institution's Obligations

The National Institute of Development Administration has approved the Long-Term Development Plan of NIDA (2008 - 2022). The Strategy 6 (of 8 Strategies) is maintaining the excellence in academic program, academic research and management which reflecting the needs of society. Especially, the Strategy 6.3 Major and Curriculum Development is to meet the needs of society under the changes of all time and pressure from environmental factors. To be complete in all majors in the development administration program, Applied Statistics Program is open for strengthening the science in statistics and related fields as well as being an identity of the institute.

13. Relationship with Other Programs Offered in Other Schools / Departments of the Institution

13.1 Courses/Subjects in the Curriculum being offered by other Schools/Departments

LC 6000 Advanced Reading and Writing in English for Graduate Studies 3 Credits

LC 4003 Advanced Integrated English Language Skill Development 3 Credits

13.2 Courses / Subjects in this Curriculum that are available for Other Curriculums

None

13.3 Administration

Curriculums and program management is interdisciplinary. The goals and objectives are in accordance with course description. An enrollment of students in each semester must be approved by their advisor. In case students are from different major, an enrollment in that course must be approved by responsible instructor under supervision of Ph.D. Program Committee of Graduate School of Applied Statistics in accordance with Regulations on Education of National Institute of Development Administration.

Section 2. Specific Information of the Program

1. Philosophy of the Program

1.1 Philosophy

The program's philosophy is to be a national leading program producing excellent Doctorate scholars in academics, synthetic theory, related phenomenon analysis, social communication skill and being a person with ethics

1.2 Objectives

To produce graduates with characteristics as follows;

1.2.1 Having high ethics in professionals and living

1.2.2 Having leadership in giving opinion in academics and professionals.

1.2.3 Having high potential in theoretical synthesis and analysis of related phenomenon.

1.2.4 Having insight in knowledge and ability to do high-quality research for creating new knowledge.

1.2.5 Having social communication skill.

1.2.6 Having analytical and synthetic skill in integration of knowledge for new solution correctly and creatively.

2. Development Plans

Development/Adjustment Plans	Strategies	Evidences/Indicators
- Improving the curriculum to meet the standards specified by AUN-QA	- Teaching staffs evaluation done by students - Annual seminar for teaching improvement - Evaluation and revision of the curriculum on every 3 – 5 years	- The result of teaching staffs evaluation done by students - Report of seminar's result - Report of the result on curriculum evaluation
- Teaching staffs and academic support staffs development	- Promotion of teaching staffs to do academic services for other organizations - Promotion of teaching staffs to research on the teaching courses in the program	- Quantity of academic services per teaching staffs in the curriculum - Quantity of research publication

Section 3. Educational System, Operation and Program Structure

1. Educational Management System

1.1 System

Binary educational system composed of 2 semesters which are the 1st semester and 2nd semester, and optionally 3rd semester for summer. The study period is 15 weeks for normal semester and 8 weeks for summer semester with equivalent teaching hours to normal semester.

1.2 Summer Semester

Summer semester is subject to the consideration of the lecturer responsible for the curriculum

1.3 Comparable Credits in the Bi-semester System

None

2. Program Operation

2.1 Teaching Hours

Semester 1	August–December
Semester 2	January–May
Summer Session	June-July

2.2 Qualifications of Applicants

2 . 2 . 1 Holder of a Master's Degree or equivalent in any related field from an institution accredited by Commission of Higher Education (CHE) or accredited by NIDA's Council approval. For applicant's work experience is in accordance with the announcement of NIDA.

2.2.2 Passing the selection procedure both paper exam and interview.

2.2.3 Have good command of English, both written and verbal with the English score that meet the minimum requirement of the announcement of NIDA.

2 . 2 . 4 Qualifications of applicants may change or add in accordance with the announcement of National Institute of Development Administration and the announcement of Graduate School of Applied Statistics.

2.3 Problems Faced by First Year Students

As the curriculum is English program, Thai students and foreign students who don't use English as the first language may have problems in English both written and verbal skill. Foreign students may also have problem in self adaption to the circumstance of Thai society and culture.

2.4 Strategies to Solve Problems or Situations' Limitation in 2.3.

2.4.1 Remedial courses in English is provided for students.

2.4.2 Lecturer are appointed to be an advisor for each student

2.4.3 Provide a pick-up car on the arrival date of international students as well as an orientation regarding educational system, places in the institute, health care and living in Thailand.

2.4.4 Students are subjected to meet their advisor at least once a month.

2.5 Five Year Plan for Student Admission

Year	2017	2018	2019	2020	2021
Number of Admission	5	5	5	5	5
Accumulated Number	-	10	15	20	20
Number of Graduates	-	-	-	5	5

2.6 Budget

The budget will be provided by the government and revenue of the National Institute of Development Administration.

2.7 Educational System

☑ Classroom

☐ Distant study via publications

☐ Distant study via the broadcast media
☐ Distant study via E-learning
☐ Distant study via the internet
☐ Others (specify)

2.8 Credit Transfer, Courses and Cross Institution Enrolment (if any)

Guidelines for Education Equivalence Credits Transfer are based on the regulations of the National Institute of Development Administration concerning education and/or the notification of the Graduate School of Applied Statistics**.**

3. Program Structure and Teaching Staff

3.1 Program Structure

3.1.1 Credit

Plan 1.1 at least 48 credits

Plan 2.1 at least 60 credits

3.1.2 Program Structure

Program structure is in accordance with the announcement of the institute on the subject of Graduate Program Criteria 2005, Doctorate Program as follows;

	Plan 1 (1.1) Focuses on research, no requirement for studying courses	**Plan 2 (2.1)** Research and studying courses requirements
Remedial courses	Non credit	Non credit
Core courses		3 credits
Major courses		12 credits
Elective courses		At least 9 credits
Dissertation	48 credits	36 credits
Total not less than	**48 credits**	**60 credits**

Remark Plan 1.1 and 2.1 is only for applicants with Master Degree

Plan 1.1 Students are subjected to present a research proposal to their advisor for consideration on setting education plan. If the proposal is initially approved by advisor, it will be passed to the Ph.D. Program Committee for consideration. For the better in working on

research, the students may take some additional studying courses in the same major of Master Program as non credit depending on their advisor's consideration.

Plan 1.1 and 2.1 Students with master degree who have no background in Statistics, Actuarial Science and Risk Management, Business Analytics and Intelligence, Industrial Statistics, Operations Research, and Logistic Systems or Policy Research and Evaluation Methods for Development, must take some basic courses in M.S. Program in Applied Statistics in the related major on appropriation and consideration of Ph.D. Program in Applied Statistics Committee.

In case of necessity and appropriation, the dean or advisor / responsible lecturer may have the Ph.D. Program students to take courses for credits exceeding the limitation of credits in the curriculum structure.

3.1.3 Course List

(1) Remedial Courses

Students in Plan 1.1 and 2.1 are subjected to take remedial course in English as non credit in following courses;

LC 4003 Advanced Integrated English Language Skills Development 3(3-0-6)
LC 6000 Advanced Reading and Writing in English for Graduate Studies 3(3-0-6)

Remark
1. The condition on exemption in remedial courses is in accordance with the announcement of the school / the institute except the condition on exemption in remedial courses in English which is in accordance with the condition of the curriculum of English course for graduate students.
2. In case of any change / improvement of the curriculum of English courses for graduate students, the conditions of remedial courses in English must change accordingly.

(2) Core Course

Students in Plan 2.1 of each major must enroll in the core course for 3 credits as follows;
AS 6050 Research Methodology 3(3-0-6)

(3) Major Courses

Students of Plan 2.1 in each major must enroll in major courses for 12 credits as follows;

Major Courses in Statistics

AS 7150 Mathematical Methods for Statistics 3(3-0-6)
AS 7151 Foundations of Probability 3(3-0-6)
AS 7152 Advanced Statistical Inference I 3(3-0-6)
AS 7153 Linear Models 3(3-0-6)

Major Courses in Actuarial Science and Quantitative Risk Management

AS 7250 Theory of Actuarial Mathematics 3(3-0-6)
AS 7251 Advanced Loss Distribution and Modeling 3(3-0-6)

AS 7252 Advanced Quantitive Risk Management Analytics 3(3-0-6)
AS 7253 Statistical Modeling in Finance, Actuarial Sciences, and Risk Management 3(3-0-6)

Major Courses in Business Analytics and Intelligence

AS 7350 Marketing Models 3(3-0-6)
AS 7351 Predictive Modeling in Finance 3(3-0-6)
AS 7352 Business Information Visualization 3(3-0-6)
AS 7353 Advanced Big Data Management 3(3-0-6)

Major Courses in Industrial Statistics, Operations Research, and Logistic Systems

AS 7450 Advanced Transportation Modeling 3(3-0-6)
AS 7451 Logistics Systems Analysis 3(3-0-6)
AS 7452 Stochastic Processes & Reliability Models 3(3-0-6)
AS 7453 Optimization and Applied Operations Research Models 3(3-0-6)

Major Courses in Population and Policy Research Methods for Development

AS 7550 Life Table and Projection Techniques for Population and Policy Research 3(3-0-6)
AS 7551 Population and Development I 3(3-0-6)
AS 7552 Thoeries and Models for Project/Program Evaluation 3(3-0-6)
AS 7553 Advanced Poll and Public Opinion Survey Methodology 3(3-0-6)

(4) Elective Courses

Students of Plan 2.1 in each major must enroll in elective course for 9 credits as follows;

Elective Courses in Statistics

AS 7161 Advanced Statistical Inference II 3(3-0-6)
AS 7162 Computer Intensive Statistics 3(3-0-6)
AS 7163 Theory of Multivariate Statistics 3(3-0-6)
AS 7164 Theory of Nonparametric Statistics 3(3-0-6)
AS 7165 Applied Time Series Analysis 3(3-0-6)
AS 7166 Statistical Computing 3(3-0-6)
AS 7167 Bayesian Analysis 3(3-0-6)
AS 7168 Categorical Data Analysis 3(3-0-6)
AS 7169 Survival Analysis 3(3-0-6)

AS 7170 Simulation and Monte Carlo Techniques 3(3-0-6)
AS 7171 Sampling Theory 3(3-0-6)
AS 7172 Advanced Experimental Designs 3(3-0-6)

Elective Courses in Actuarial Science and Quantitative Risk Management

AS 7261 Advanced non-Life Insurance Mathematics 3(3-0-6)
AS 7262 Advanced Life Insurance Mathematics 3(3-0-6)
AS 7263 Quantitative Equity Portfolio Management 3(3-0-6)
AS 7264 Advanced Risk Theory 3(3-0-6)
AS 7265 Simulation Methods and Stochastic Process for Finance, Actuarial Sciences and Risk Management 3(3-0-6)
AS 7266 Financial Time Series Analysis 3(3-0-6)

Elective Courses in Business Analytics and Intelligence

AS 7361 Modeling Techniques in Marketing Decision 3(3-0-6)
AS 7362 Advanced Analytics and Data Mining Applications 3(3-0-6)
AS 7363 Advanced Human Resource Analytics 3(3-0-6)
AS 7364 Advanced Customer Relationship Management Analytics 3(3-0-6)
AS 7365 Theories and Practices in Social Network and Media Analysis 3(3-0-6)
AS 7366 Theories and Practices in Spatial Data Analysis 3(3-0-6)
AS 7552 Thoeries and Models for Project/Program Evaluation 3(3-0-6)
AS 7553 Advanced Poll and Public Opinion Survey Methodology 3(3-0-6)
AS 7567 Policy Formulation and Futuristic Research Methods 3(3-0-6)
AS 7568 Theories and Practices in System Dynamic Simulation 3(3-0-6)
AS 7569 Qualitative Methods for Policy Research 3(3-0-6)
AS 7370 Meta-Analysis for Applied Research 3(3-0-6)

Elective Courses in Industrial Statistics, Operations Research, and Logistic Systems

AS 7461 Stochastic Process I 3(3-0-6)
AS 7462 Stochastic Process II 3(3-0-6)
AS 7463 Mathematical Programming 3(3-0-6)
AS 7464 Integer Programming 3(3-0-6)
AS 7465 Nonlinear Programming 3(3-0-6)
AS 7466 Quantitative Analysis for Logistics and Supply Chain Management 3(3-0-6)
AS 7467 Advanced Logistics Management 3(3-0-6)
AS 7468 Network Flows 3(3-0-6)

AS 7469 Inventory Theory 3(3-0-6)
AS 7470 Production Planning and Scheduling 3(3-0-6)

Elective Courses in Population and Policy Research Methods for Development

AS 7561 Population and Development II 3(3-0-6)
AS 7562 Theories and Practices in Project Analysis and Feasibility Study 3(3-0-6)
AS 7563 Human Resource Planning and Assessment 3(3-0-6)
AS 7564 Aging Society 3(3-0-6)
AS 7565 Feminism and Development 3(3-0-6)
AS 7566 International Migration and Development 3(3-0-6)
AS 7567 Policy Formulation and Futuristic Research Methods 3(3-0-6)
AS 7568 Theories and Practices in System Dynamic Simulation 3(3-0-6)
AS 7569 Qualitative Methods for Policy Research 3(3-0-6)
AS 7570 Meta-Analysis for Applied Research 3(3-0-6)
AS 7351 Predictive Modeling in Finance 3(3-0-6)
AS 7364 Advanced Customer Relationship Management Analytics 3(3-0-6)

Selected Topics in Applied Statistics Courses

AS 8001 Seminar in Statistics 3(0-6-6)
AS 8002 Seminar in Actuarial Science and Quantitative Risk Management 3(0-6-6)
AS 8003 Seminar in Business Analytics and Intelligence 3(0-6-6)
AS 8004 Seminar in Industrial Statistics, Operations Research, and Logistic Systems 3(0-6-6)
AS 8005 Seminar in Population and Policy Research Methods for Development 3(0-6-6)
AS 8801-8820 Selected Topics in Applied Statistics 3(0-6-6)

Remark

(1) The Elective courses also include other graduate courses offered by the school or others in NIDA (To register for these courses, students must receive approvals from his/her advisor)
(2) Courses opened in each semester will be selected by the school and the institute.

Independent Study

(1) AS 9000 Independent Study 3(0-0-12)

Dissertation

(1) AS 9900 Dissertation 36/48 Credits

3.1.4 Study Plan

Plan 1.1

Year	1st Semester	2nd Semester
1	LC 6000 Advanced Reading and Writing in English for Graduate Studies 3 Credits - Take a Qualifying Examination	LC 4003 Advanced Integrated English Language Skill Development 3 Credits AS 9900 Dissertation 6-9 Credits
2	AS 9900 Dissertation 3-15 Credits	AS 9900 Dissertation 3-15 Credits
3	AS 9900 Dissertation 3-15 Credits	AS 9900 Dissertation 3-15 Credits

Remark: Students must pass Qualifying Examination within 4 semesters otherwise their student status will be terminate

Plan 2.1 (Major in Statistics)

Year	1st Semester	2nd Semester
1	LC 6000 Advanced Reading and Writing in English for Graduate Studies 3 Credits AS 6050 Research Methodology 3 Credits AS 7151 Advanced Statistical Inference I 3 Credits AS 7150 Mathematical Methods for Statistics 3 Credits	LC 4003 Advanced Integrated English Language Skill Development 3 Credits AS 7152 Foundations of Probability 3 Credits AS 7153 Linear Models 3 Credits - Take a Qualifying Examination AS 9900 Dissertation 3-9 Credits
2	Elective courses 3-9 Credits AS 9900 Dissertation 3-15 Credits	Elective courses 3-9 Credits AS 9900 Dissertation 3-15 Credits
3	AS 9900 Dissertation 3-15 Credits	AS 9900 Dissertation 3-15 Credits

Plan 2.1 (Major in Actuarial Science and Quantitative Risk Management)

Year	1st Semester	2nd Semester
1	LC 6000 Advanced Reading and Writing in English for Graduate Studies 3 Credits AS 6050 Research Methodology 3 Credits AS 7250 Theory of Actuarial Mathematics 3 Credits AS 7253 Statistical Modeling in Finance,	LC 4003 Advanced Integrated English Language Skill Development 3 Credits AS 7251 Advanced Loss Distribution and Modeling 3 Credits AS 7252 Advanced Quantitive Risk Management Analytics 3 Credits

	Actuarial Sciences, and Risk Management 3 Credits	- Take a Qualifying Examination AS 9900 Dissertation 3-9 Credits
2	Elective courses 3-9 Credits AS 9900 Dissertation 3-15 Credits	Elective courses 3-9 Credits AS 9900 Dissertation 3-15 Credits
3	AS 9900 Dissertation 3-15 Credits	AS 9900 Dissertation 3-15 Credits

Plan 2.1 (Major in Business Analytics and Intelligence)

Year	1st Semester	2nd Semester
1	LC 6000 Advanced Reading and Writing in English for Graduate Studies 3 Credits AS 6050 Research Methodology 3 Credits AS 7350 Marketing Models 3 Credits AS 7351 Predictive Modeling in Finance 3 Credits	LC 4003 Advanced Integrated English Language Skill Development 3 Credits AS 9900 Dissertation 3-9 Credits AS 7352 Business Information Visualization 3 Credits AS 7353 Advanced Big Data Management 3 Credits - Take a Qualifying Examination
2	Elective courses 3-9 Credits AS 9900 Dissertation 3-15 Credits	Elective courses 3-9 Credits AS 9900 Dissertation 3-15 Credits
3	AS 9900 Dissertation 3-15 Credits	AS 9900 Dissertation 3-15 Credits

Plan 2.1 (Major in Industrial Statistics, Operations Research, and Logistic Systems)

Year	1st Semester	2nd Semester
1	LC 6000 Advanced Reading and Writing in English for Graduate Studies 3 Credits AS 6050 Research Methodology 3 Credits AS 7450 Advanced Transportation modeling 3 Credits AS 7451 Logistics Systems Analysis 3 Credits	LC 4003 Advanced Integrated English Language Skill Development 3 Credits AS 7452 Stochastic Processes & Reliability Models 3 Credits AS 7453 Optimization and Applied Operations Research Models 3 Credits - Take a Qualifying Examination AS 9900 Dissertation 3-9 Credits
2	Elective courses 3-9 Credits AS 9900 Dissertation 3-15 Credits	Elective courses 3-9 Credits AS 9900 Dissertation 3-15 Credits

3	AS 9900 Dissertation 3-15 Credits	AS 9900 Dissertation 3-15 Credits

Plan 2.1 (Major in Population and Policy Research Methods for Development)

Year	1st Semester	2nd Semester
1	LC 6000 Advanced Reading and Writing in English for Graduate Studies 3 Credits AS 6050 Research Methodology 3 Credits AS 7550 Life Table and Projection Techniques for Population and Policy Research 3 Credits AS 7551 Population and Development I 3 Credits	LC 4003 Advanced Integrated English Language Skill Development 3 Credits AS 7552 Thoeries and Models for Project/Program Evaluation 3 Credits AS 7553 Advanced Poll and Public Opinion Survey Methodology 3 Credits - Take a Qualifying Examination AS 9900 Dissertation 3-9 Credits
2	Elective courses 3-9 Credits AS 9900 Dissertation 3-15 Credits	Elective courses 3-9 Credits AS 9900 Dissertation 3-15 Credits
3	AS 9900 Dissertation 3-15 Credits	AS 9900 Dissertation 3-15 Credits

3.1.5 Course Description

Remedial Courses

LC 4003 Advanced Integrated English Language Skills Development 3 Credits (Non credit)

Course contents and teaching activities focus on the integrated skills of listening, speaking, reading and writing with a particular emphasis on academic writing. Students will also work in small groups, practicing paper presentation techniques, precise writing, and research writing

LC 6000 Advanced Reading and Writing in English for Graduate Studies 3 Credits (Non credit)

Review of essential reading and writing strategies required to read and write academic English. Course contents include work on sentence structures, vocabulary and recognition of major thought relationships in paragraphs, as well as practice in reading and writing academic English

Core Courses

AS 6050 Research Methodology **3 Credits**

Philosophy of sciences; epistemology; inquiry skills; literature review; theory building and testing; research problem formulation, development of research hypothesis, research design; qualitative research methods; mixed methods; quantitative research methods; sampling; questionnaire design and scale construction; data collection; correlational research; experimental research; quasi-experimental research; data analysis; research report writing and presentation; publication and publishing procedures.

Major Courses in Statistics

AS 7150 Mathematical Methods for Statistics **3 Credits**

Real number, point set theory, limit points, limits, sequences and series, Taylor series (multivariate), uniform convergence, Riemann-Stieltjes integrals.

AS 7151 Foundations of Probability **3 Credits**

Probability theory, with emphasis on constructing rigorous proofs; measure spaces, measurable functions, random variables and induced measures, distribution functions, Lebesque integral, product measure and independence, Borel Cantelli lemma, modes of convergence.

AS 7152 Advanced Statistical Inference I **3 Credits**

Concept of convergence, asymptotic methods including the delta method, sufficiency, asymptotic efficiency, Fisher information and information bounds for estimation, maximum likelihood estimation, the EM-algorithm, Bayes estimation, decision theory.

Prerequisite: AS 7151 Foundations of Probability or instructor consent.

AS 7153 Linear Models **3 Credits**

Linear space and matrix theory; multivariate normal distribution and distribution of quadratic forms; general linear models of full rank and less than full rank; estimation and testing of linear hypotheses; random and mixed models applications; residual analysis and effects of departure from the underlying assumptions.

Elective Courses in Statistics

AS 7161 Advanced Statistical Inference II **3 Credits**

Hypothesis testing, asymptotic of the likelihood ratio test, asymptotic efficiency, statistical functionals, robustness, bootstrap and jackknife, estimation with dependent data.

Prerequistes: AS 7151 Advanced Statistical Inference I or instructor consent.

AS 7162 Computer Intensive Statistics **3 Credits**

Computer arithmetic; random variate generation; numerical optimization; numerical linear algebra; smoothing techniques; bootstrap methods; cross-validation; MCMC; EM and related algorithms, other topics per student/instructor interests.

AS 7163 Theory of Multivariate Statistics **3 Credits**

Basic theory of multivariate; multivariate normal distribution; estimation and testing of hypothesis when population is multivariate normal distribution; use of Hotelling T^2; multivariate regression analysis; discriminant and classification analysis; principle component; factor analysis; canonical analysis; and others.

Prerequisite: AS 7151 Advanced Statistical Inference I or instructor consent.

AS 7164 Theory of Nonparametric Statistics **3 Credits**

Order statistics; linear rank statistics; properties of nonparametric tests; robust estimation; measure of association; and asymptotic relative efficiency.

Prerequisite: AS 7152 Advanced Statistical Inference I or instructor consent.

AS 7165 Applied Time Series Analysis **3 Credits**

Time series analysis in the time domain and frequency domain; spectrum and autoregressive moving average models; autocorrelation and partial autocorrelation distribution; spectral density; estimation of parameters and tests; multivariate time series; cross-covariance analysis of multiple time series; and cross-spectral analysis.

Prerequisite: AS 7152 Foundations of Probability or instructor consent.

AS 7166 Statistical Computing **3 Credits**

Introduction to statistical computing; basic numerical methods; numerical linear algebra; nonlinear statistical methods; numerical integration and approximation; computation techniques for probability distribution; and other topics of current interest including uses of statistical packages.

AS 7167 Bayesian Analysis **3 Credits**

Decision theory; coherence and utility; subjective probability; likelihood principle; conjugate families; structure of Bayesian inference; asymptotic approximations for posterior distribution; sequential experiments; exchangeability hierarchical models; and nonparametric Bayes procedures and empirical Bayes methods.

AS 7168 Categorical Data Analysis **3 Credits**

Structural models of counting data; log-linear models; distribution theory; logistic regression; and maximum likelihood and weighted least squares estimation for cross-classified categorical data.

AS 7169 Survival Analysis **3 Credits**

Statistical failure models; life test procedures; system reliability; Kaplan-Meier estimator and Cox's regression model

Prerequisite: AS 7152 Foundations of Probability or instructor consent.

AS 7170 Simulation and Monte Carlo Techniques **3 Credits**

Review of statistics such as efficiency, information, Poisson process, Markov process; random number, random variable and stochastic process generation; simulation of discrete-event systems; statistical analysis of discrete-event systems; variance reduction techniques; and Markov chain Monte Carlo (MCMC)

AS 7171 Sampling Theory **3 Credits**

Theories and methods of sample selection; non-probability sampling; simple random sampling; systematic sampling; stratified sampling; cluster sampling and multi-stage sampling; double sampling; estimation from sample survey; post-stratification weight; dealing with missing value from sample survey; and errors and biases in sample survey.

AS 7172 Advanced Experimental Designs **3 Credits**

Design principles; factorial, fractional factorial; confounding; repeated measures designs; lattice designs; balanced and partially balanced incomplete block designs; response surface methodology; and optimal designs.

Major Courses in Actuarial Science and Quantitative Risk Management

AS 7250 Theory of Actuarial Mathematics **3 Credits**

Theories and methods for life and casualty actuarial mathematics; survival models; mortality table and population projection; theories and methods for life insurance premium determination; theories and methods for casualty actuarial mathematics; casualty premium determination; risk theory and assessment; ethic and code of conduct of actuary.

AS 7251 Advanced Loss Distribution and Modeling **3 Credits**

Modeling Severity; ModelingFrequency; aggregate models and their modifications; risk measures; construction of empirical models.

AS 7252 Advanced Quantitive Risk Management Analytics **3 Credits**

Applications of multivariate techniques to asset management; Kalman filter and time series methods in term-structure analysis; data mining methods; modern nonlinear regression; credit scoring model; and classification tree methods in finance and risk management.

AS 7253 Statistical Modeling in Finance, Actuarial Sciences, and Risk Management **3 Credits**

Actuarial science and risk management ideas associated with statistical modeling in three general important finance areas; asset management, derivative pricing, and fixed income.

Elective Courses in Actuarial Science and Quantitative Risk Management

AS 7261 Advanced non-Life Insurance Mathematics **3 Credits**

Theories, methods, and practices in non-life insurance mathematics; modeling frequency and severity for non-life actuary; aggregate loss distribution; theories for premium determination; pricing models; components of insurance premium; unit of exposure; expense loading; risk classification premium; individual risk and group risk; theories and methods of forecasting loss reserve; loss reserve and capital adequacy; loss reserve valuation; effect of loss reserve to accounting system; and theories and methods for reinsurance; ruin model.

AS 7262 Advanced Life Insurance Mathematics **3 Credits**

Review concept of life insurance: Life annuities; benefit premiums, benefit reserves, Stochastics model for life insurance mathematics: Markov model, stochastic model for interest rates and demography, cash flow and reseres, cover and Thile's differential, Hatterndorf's theorem and unit-linked policies.

AS 7263 Quantitative Equity Portfolio Management **3 Credits**

Reviews of linear programming and quadratic programming; fundamental of QEPM; basic QEPM models; factors and factor choice; fundamental factor model; economic factor models; forecasting factor premiums and exposures; rebalancing and transaction cost; leverage; market neutral; Bayesian; and related topics.

AS 7264 Advanced Risk Theory **3 Credits**

Advanced risk theory; risk characteristics and insurance; analysis of insurance coverage; distribution of frequency and severity; short-term risk model; finite collective risk model and extended time of risk model; applications and practices of risk theory; and Ruin model and theory.

AS 7265 Simulation Methods and Stochastic Process for Finance, Actuarial Sciences, and Risk Management **3 Credits**

Random variable generations; multivariate random variable generations; variance reduction methods and method of statistical analysis of simulation outputs; importance sampling; martingale variables; stratification and the estimation of derivatives; pricing American options; stochastic processes; Poisson processes; renewal/regenerative processes; discrete and continuous-time Markov chains; Markov decision processes; continuous-time Markov chain; advanced renewal theory; Brownian motion; random walks model; value at risk; and scenario simulation for finance, actuarial sciences, and risk management.

AS 7266 Financial Time Series Analysis **3 Credits**

Financial time series and their characteristics; linear time series analysis; conditional heteroscedastic models; ARCH models; GARCH models; CHARMA model; and Kalman filter.

Major Courses in Business Analytics and Intelligence

AS 7350 Marketing Models **3 Credits**

Theory and models in marketing; consumer behavior; organizational buying models; price; product; advertising; promotion; sales force; distribution; new product planning; strategy; and decision support systems.

AS 7351 Predictive Modeling in Finance **3 Credits**

Predictive modeling in finance; Time Series Analysis; ARIMA, ARCH models; GARCH models; CHARMA model; Stochastic process; Artificial Neural Networks in finance; bankrupcy models; credit scoring models; and risk modeling.

AS 7352 Business Information Visualization **3 Credits**

Business information visualization, graphics for exploratory data analysis, regression graphics, categorical data visualization, multivariate data visualization, time-series data visualization, spatial data visualization, social network visualization, 3D animation for business information, graphic visualization, and information visualization.

AS 7353 Advanced Big Data Management **3 Credits**

Sources of data; measurement and scaling; development of data collection instrument; managing structured and unstructured data; how to upload, store, retrieve and process big data; data quality audit; missing value and imputation; data transformation; data storage and retrieval.

Elective Courses in Business Analytics and Intelligence

AS 7361 Modeling Techniques in Marketing Decision **3 Credits**

Features of marketing data; modeling continuous dependent variable; binomial dependent variable; unordered multinomial dependent variable; ordered multinomial dependent variable; limited dependent variable; and duration dependent variable.

AS 7362 Advanced Analytics and Data Mining Applications **3 Credits**

Applications in customer analytics, financial analytics, risk analytics, fraud detection, text mining, web analytics etc. The course is designed to be "hands-on" in that students will develop understanding mainly through conducting application projects and presenting results.

AS 7363 Advanced Human Resource Analytics **3 Credits**

Confirmatory factor analysis for measurement model and measurement invariant used for human resource assessment; Path analysis and Structural Equation Modeling for human resource research; Growth curve and latent growth curve modeling for human resource development; Integer programming for human resource optimization including work scheduling and job rotation.

AS 7364 Advanced Customer Relationship Management Analytics **3 Credits**

Theories and practices of customer relationship management and customer relationship management analytics; market segmentation using K-means clustering and self-organizing map; up-sell; cross-sell; customer retention; and direct marketing using artificial neural network; market basket analysis; response analysis; recency, frequency, and monetary value analysis; churn model; and decision tress.

AS 7365 Theories and Practices in Social Network and Media Analysis **3 Credits**

Theories and practices in social network and media analysis, sociomety and social network; data collection on social network; social network detection and visualization; social network dynamic and growth; computing social network centrality; community and cluster on social network; communication and diffusion of innovation on social network; network models; and information models.

AS 7366 Theories and Practices in Spatial Data Analysis **3 Credits**

Theories and practices in spatial data analysis; geographical information system and business analytics; sampling spatial data; point pattern analysis; spatially continuous data analysis; spatial regression; spatial regression models for count and categorical dependent variables; map and spatial data visualization.

Major Courses in Industrial Statistics, Operations Research, and Logistic Systems

AS 7450 Advanced Transportation Modeling **3 Credits**

Transportation network analysis for passenger and freight, discussion of topics of special interest in advance transportation planning and operations with fright emphasis including developing four-steps model, equilibrium assignment, network design problem, capacity analysis, demand estimation technique, integrated facility and transportation network analysis, multimodal transportation, environmental impact assessment for sustainable planning. Each individual student has to participate in the discussion actively by presenting his/her own research works.

AS 7451 Logistics Systems Analysis **3 Credits**

The application of mathematical model to analyze problems in the logistics systems, Logistics management theory, Freight transportation planning, Logistics and supply chain network design, Risk management in logistics and supply chain, Revenue management and algorithms, Advanced mathematical models and computational algorithms to solve the problem, Skills development in logistics solutions in large-scale and complex cases

AS 7452 Stochastic Processes & Reliability Models **3 Credits**

Introduction to stochastic models; Poisson processes; renewal/regenerative processes; discrete and continuous-time Markov chains; Markov decision processes; applications in reliability, business and industrial statistics

AS 7453 Optimization and Applied Operations Research Models **3 Credits**

Linear programming; simplex method; duality theorem; introduction to network flow models; non-linear programming; and theory and algorithms for constrained and unconstrained optimization problems.

Elective Courses in Industrial Statistics, Operations Research, and Logistic Systems

AS 7461 Stochastic Process I **3 Credits**

Introduction to stochastic processes; Poisson processes; renewal/regenerative processes; discrete and continuous-time Markov chains; Markov decision processes; and applications in stochastic inventory models and queuing systems.

AS 7462 Stochastic Process II **3 Credits**

Continuous-time Markov chain; semi-Markov process; advanced renewal theory; Brownian motion; random walks with applications.

AS 7463 Mathematical Programming **3 Credits**

Linear programming; simplex method; duality theorem; introduction to network flow models; non-linear programming; and theory and algorithms for constrained and unconstrained optimization problems.

AS 7464 Integer Programming **3 Credits**

Computational complexity; branch and bound; polyhedral theory; cutting plane algorithms; Lagrangian relaxation; and heuristic algorithms for integer programs.

AS 7465 Nonlinear Programming **3 Credits**

Unconstrained nonlinear problem with applications; constrained nonlinear problem with applications; duality theory; and computational methods for nonlinear programs e.g., quasi-Newton methods, Newton's methods, and penalty methods.

AS 7466 Quantitative Analysis for Logistics and Supply Chain Management **3 Credits**

Quantitative analysis Queuing theory, Linear regression analysis, Demand forecasting and time series model, Transportation mode selection model, Transportation and distribution problems, Facility location models, Inventory optimization model, Mathematical models, computer programming and algorithms for transportation and network design, Case studies.

AS 7467 Advanced Logistics Management **3 Credits**

The application of mathematical model to analyze problems in the logistics systems, Logistics management theory, Freight transportation planning, Logistics and supply chain network design, Risk management in logistics and supply chain, Revenue management and algorithms, Advanced mathematical models and computational algorithms to solve the problem, Skills development in logistics solutions in large-scale and complex cases

AS 7468 Network Flows **3 Credits**

Survey of solution techniques and problems that have formulations in terms of flows in networks; max-flow min-cut theorem; minimum cost flows; relationship with linear programming; transportation problems; and critical path scheduling.

AS 7469 Inventory Theory **3 Credits**

Inventory policies; deterministic inventory models; stochastic inventory model; Multi-echelon inventory systems; supply chain contracts and coordination.

AS 7470 Production Planning and Scheduling **3 Credits**

Production planning fundamental; made-to-order and made-to-stock; master production schedule; material requirement planning; just-in-time production planning; optimized production technology; production scheduling fundamental; single machine scheduling; flow-

shops and job-shops scheduling; NP problems; and scheduling heuristics and others scheduling approach for multiple machines.

Major Courses in Population and Policy Research Methods for Development

AS 7550 Life Table and Projection Techniques for Population and Policy Research **3 Credits**

Mathematical theory of human population structure; deterministic and stochastic models of population growth; life table and stationary population theory and extended models; stable population theory and its extensions; and projection and forecasting

AS 7551 Population and Development I **3 Credits**

Overview of the interrelationships between development and population change; conceptual framework and theories of population and development at the macro and micro perspectives; analytical approaches to study fertility, reproductive health, morbidity, mortality, marriage, divorce, migration and urbanization; implication of development policies, program and projects for changes in demographic behavior; and sufficient economy and population.

AS 7552 Thoeries and Models for Project/Program Evaluation **3 Credits**

Theories for project/program evaluation; project/program evaluation process; project/program evaluation models; need assessment; quantitative and qualitative project/program evaluation; project/program evaluation design; indicator selection for project/program evaluation; cost-effectiveness evaluation; project/program assessment; effectiveness and efficiency assessment; impact assessment; monitoring program implementation; ethics for evaluators.

AS 7553 Advanced Poll and Public Opinion Survey Methodology **3 Credits**

Overview of polls and public opinion survey; Sample survey; poll and public opinion survey; population and sampling; Type of survey errors; methods of data collection; non-respondants in survey; questions and answer in survey; interview for survey; quality check and data preparation; pre-processing survey data; data analysis for survey; applying poll and public opinion survey for policy planning and development.

Elective Courses in Population and Policy Research Methods for Development

AS 7561 Population and Development II **3 Credits**

Population, education, and human resource development; population and health; population and agriculture; and population, natural resource, and environment.

AS 7562 Theories and Practices in Project Analysis and Feasibility Study **3 Credits**

Theories, methods, models, and practice for project analysis and feasibility study; forecasting for assessing project feasibility; management, legal, economics, social, technical, marketing, and financial feasibility study; Projecting pro-forma financial statement and capital budgeting; impact assessment on various stakeholders.

AS 7563 Human Resource Planning and Assessment **3 Credits**

Techniques and methods utilized in strategic human resource plaaning in various area such as business, education, and public health; Theories, methods, models, and practices in human resource assessment; psychometric theory; scale construction; competency assessment.

AS 7564 Aging Society **3 Credits**

Theories and methods related to aging society from medicine, psychology, demography, sociology, and economic perspectives; aging and personal finance including pension; health and life insurance; financial planning for retirement; healthy aging; aging and well-being; psychology and aging; sociology and aging; aging and its impacts on society and economics; aging and public policy with the emphasis on Thailand

AS 7565 Feminism and Development **3 Credits**

Overview of women's role and status from past to present; theories related to changing role and status of women; development of Thai women's role and status; roles of women in various developmental programs such as programs in family planning, mother and child health care, environmental conservation, skill labor development, community development etc.; and issues and policies related to women in development.

AS 7566 International Migration and Development **3 Credits**

Internal migration; international migration; urbanization; interrelationships among migration, urbanization and socio-economic development; and impacts of plans and policies related to development of major cities, special areas, and rural areas on migration.

AS 7567 Policy Formulation and Futuristic Research Methods **3 Credits**

Theories and models for future studies and furistic research; quantitative and qualitative futuristic research methods; scenario analysis; Delphi method; cross-impact analysis; technology forecasting; system dynamic simulation; demographic projection; future studies and policy formulation; Theories and models in public policy.

AS 7568 Theories and Practices in System Dynamic Simulation **3 Credits**

Theories and practices of system dynamics; problem definition, flow structures of system dynamics; system dynamic model building; visualizing system dynamics; evaluating

system dynamics; computer application for system dynamics; applications of system dynamic simulation on public policy formulation.

AS 7569 Qualitative Methods for Policy Research **3 Credits**

The theoretical and philosophical foundations and the applications of qualitative research methods; interview, observations,video and tape recording, and fieldwork; qualitative data analysis including critical incident technique, phenomenology, grounded theory, discourse analysis, narratology, case study,participative action research, ethnography, feminism, and mixed methods; triangulation and validity for qualitative research; qualitative research writing and presentation; ethics for qualitative research; qualitative research as a tool for policy formulation and evaluation.

AS 7570 Meta-Analysis for Applied Research **3 Credits**

Theories and methods of meta-analysis; development of research framework for meta-analysis; literature review and search for meta-analysis; coding and evaluating research results; statistical methods for meta-analysis; psychometric meta-analysis; combining effect size; measure of heterogeneity of effect size; fixed and random effects models; meta-regression; Bayesian estimation and multi-level modeling for meta-analysis; subgroup and stratified analysis; analyzing publication bias; writing up meta-analysis paper; meta-analysis and public policy formulation.

Selected Topics in Applied Statistics Courses

AS 8001 Seminar in Statistics **3 Credits**

Discussions on the new and current issues related to statistics. Leaders of the discussion will be lecturers, academicians, researchers, or practitioners. Each individual student has to participate in the discussion actively by presenting his/her own works.

AS 8002 Seminar in Actuarial Science and Quantitative Risk Management **3 Credits**

Discussions on the new and current issues related to Actuarial Science and Quantitative Risk Management. Leaders of the discussion will be lecturers, academicians, researchers, or practitioners. Each individual student has to participate in the discussion actively by presenting his/her own works.

AS 8003 Seminar in Business Analytics and Intelligence **3 Credits**

Discussions on the new and current issues related to Business Analytics and Intelligence. Leaders of the discussion will be lecturers, academicians, researchers, or practitioners. Each individual student has to participate in the discussion actively by presenting his/her own works.

AS 8004 Seminar in Industrial Statistics, Operations Research, and Logistic Systems **3 Credits**

Discussions on the new and current issues related to Industrial Statistics, Operations Research, and Logistic Systems. Leaders of the discussion will be lecturers, academicians, researchers, or practitioners. Each individual student has to participate in the discussion actively by presenting his/her own works.

AS 8005 Seminar in Population and Policy Research Methods for Development **3 Credits**

Discussions on the new and current issues related to Population and Policy Research Methods for Development. Leaders of the discussion will be lecturers, academicians, researchers, or practitioners. Each individual student has to participate in the discussion actively by presenting his/her own works.

AS 8801-8820 Selected Topics in Applied Statistics **3 Credits**

Lecture in the areas and issues beyond those covered in other courses. Topics will be announced prior to being offered.

Independent Study

AS 9000 Independent Study **3 Credits**

Students choose their own interesting topics to study by themselves, the topics must be approved by a faculty member who is responsible for the course, and they are required to write the reports.

Dissertation

AS 9900 Dissertation **36/48 Credits**

A student-initiated research report on a particular topic under consultation of an advisor, together with an oral examination. The study must be extensive and of acceptable research standards.

3.2 Name, Surname, Personal ID Number, Position, Education of Program Faculty

3.2.1 The Instructors Responsible for the Curriculum

Name-Family Name	ID Card Number	Academic Degrees	Institutes of Attainment
Prof.Dr. Samruam Chongcharoen	xxxxxxxxxxxx	Ph.D. (Statistics) M.A. (Mathematics Actuarial Science) M.S. (Applied Statistics) B.Ed.(Mathematics)	University of Missouri-Columbia, U.S.A. (1998) Central Connecticut State University, U.S.A. (1994) National Institute of Development Administration, Thailand. (1984) Srinakharinwirot University at Phitsanulok, Thailand. (1981)
Assoc.Prof.Dr.Duanpen Teerawanviwat	xxxxxxxxxxxx	Ph.D. (Sociology) M.A. (Sociology) M.Ed. (Educational Research) B.Ed. 2nd Class Hons	University of Hawaii (Manoa), U.S.A. (1989) University of Florida, U.S.A. (1981) Chulalongkorn University, Thailand. (1976) Chulalongkorn University, Thailand. (1974)

Name-Family Name	ID Card Number	Academic Degrees	Institutes of Attainment
Assist.Prof.Dr. Preecha Vichitthamaros	xxxxxxxxxxxx	Ph.D. (Management of Technology)	Asian Institute of Technology, Thailand. (2002)

		MBA (Management of Technology) M.S.(Statistics) B.Sc. 2nd Class Hons.	Asian Institute of Technology, Thailand. (1995) Chulalongkorn University. (1991) Chulalongkorn University. (1989)

3.2.2 Program's Staffs

Name-Family Name	ID Card Number	Academic Degrees	Institutes of Attainment
Prof.Dr. Samruam Chongcharoen	xxxxxxxxxxxxx	Ph.D. (Statistics) M.A. (Mathematics Actuarial Science) M.S. (Applied Statistics) B.Ed.(Mathematics)	University of Missouri-Columbia, U.S.A. (1998) Central Connecticut State University, U.S.A. (1994) National Institute of Development Administration, Thailand. (1984) Srinakharinwirot University at Phitsanulok, Thailand. (1981)

Name-Family Name	ID Card Number	Academic Degrees	Institutes of Attainment
Assoc.Prof.Dr.Duanpen Teerawanviwat	xxxxxxxxxxxxx	Ph.D. (Sociology) M.A. (Sociology) M.Ed. (Educational Research) B.Ed. 2nd Class Hons	University of Hawaii (Manoa), U.S.A. (1989) University of Florida, U.S.A. (1981) Chulalongkorn University, Thailand. (1976) Chulalongkorn University, Thailand.

			(1974)
Assist.Prof.Dr. Preecha Vichitthamaros	xxxxxxxxxxxx	Ph.D. (Management of Technology) MBA (Management of Technology) M.S.(Statistics) B.Sc. 2nd Class Hons.	Asian Institute of Technology, Thailand. (2002) Asian Institute of Technology, Thailand. (1995) Chulalongkorn University. (1991) Chulalongkorn University. (1989)
Prof.Dr. Jirawan Jitthavech	xxxxxxxxxxxx	Ph.D. (Statistics) M.S. (Applied Statistics) B.Sc.(Education)	University of Georgia, U.S.A. (1984) National Institute of Development Administration, Thailand. (1976) Sonkhanakarin University, Thailand. (1974)

Name-Family Name	**ID Card Number**	**Academic Degrees**	**Institutes of Attainment**
Assoc.Prof. Dr.Pachitjanut Siripanich	xxxxxxxxxxxx	Ph.D. (Statistics) M.S. (Mathematics) B.S. (Mathematics)	Oregon State University, U.S.A. (1987) The Senate of Carleton University, Canada. (1976) Chulalongkorn University. (1974)
Dr. Arnond Sakworawich	xxxxxxxxxxxx	Ph.D. (Psychometrics and Quantitative Psychology) M.A. (Psychology Industrial and Organizational) M.B.A.(International	Fordham University, U.S.A. (2013) Thammasat University, Thailand. (2004) National Institute of

		Business Management) B.B.A. (Organizational and Human Resource Management)	Development Administration, Thailand. (2001) Chulalongkorn University. (1998)

3.2.3 Invited Lecturers / Special Lecturer

Title / Name - Surname	ID No.	Degree	Major	Institute
Assoc. Prof Dr. Chai Podhisita	xxxxxxxxxxxxx	Ph.D.	Anthropology	Mahidol University
Asst. Prof Dr. Dararatt Anantanasuwong	xxxxxxxxxxxxx	Ph.D.	Econ.	University of Tennessee at Knoxville, USA.
Prof.Dr.Prachoom Suwattee	xxxxxxxxxxxxx	Ph.D.	Statistics	North Carolina State University, U.S.A.
Assoc. Prof Dr. Pungpond Rukumnuaykit	xxxxxxxxxxxxx	Ph.D.	Economics	National Institute of Development Administration
Asst. Prof Dr. Sujitra Chamnivickorn	xxxxxxxxxxxxx	Ph.D.	Economics	University of Illinois at Chicago, USA.
Assoc. Prof Dr. Udomsak Seenprachawong	xxxxxxxxxxxxx	Ph.D.	Economics	University of Memphis, USA.
Assoc.Prof Dr Virol Boonyasombat	xxxxxxxxxxxxx	Ph.D.	Maths.	The Ohio State University, U.S.A.
Asst. Prof Dr. Winai Bhosuwan	xxxxxxxxxxxxx	Ph.D.	Statistics & Operations Research	RMIT, Australia.
Assoc. Prof Dr. Yothin Sawangdee	xxxxxxxxxxxxx	Ph.D.	Sociology	University of North Carolina at Chapel Hill, USA
Asst.Prof Weena Chaisilaparungruang	xxxxxxxxxxxxx	M.S.	Statistics & Actuarial Science,	University, of Iowa, U.S.A.
Dr. Tanakorn Likitapiwat	xxxxxxxxxxxxx	Ph.D.	Finance	University of Memphis, U.S.A.

Title / Name - Surname	ID No.	Degree	Major	Institute
Dr. Chayanin Kerdpholngarm	xxxxxxxxxxxx	Ph.D.	Risk Management and Insurance	Georgia State University, U.S.A.

4. Fiels Works (Apprenticeship or Cooperative Education, if any)

None

5. Regulations on Research Projects (if any)

5.1 Brief Description

The dissertation must be an initiative work in theory and shown the expertise in the subject with good quality for publication in academic journal. The process of working on dissertation of students must be under supervision of their dissertation committee appointed by the dean and approval of Ph.D. Program Committee, Graduate School of Applied Statistics. The dissertation committees include 3 – 4 members. The Chairman must be a lecturer of the school and the co-chairman (if any) can be the lecturer of the school or an expert from within or outside the institute. The dissertation defense must consist of at least 1 expert from outside the institute, and a chairman of dissertation defense committee (can't be dissertation advisor and co-advisor).

5.2 Learning standards

The standard of research is in accordance with the regulations of the National Institute of Development Administration and the consideration on the purpose of educational Plan.

5.3 Timetable of Taking Dissertation Course

After the pass of Qualifying Examination

5.4 Credits

Plan 1 (1.1) 48 credits

Plan 2 (2.1) 36 credits

5.5 Preparation for Students Working on Dissertation

Appointment for dissertation consultancy is made and recorded. Proposal presentation and progress are also made for an improved work on dissertation as well as the giving information on the website.

5.6 Evaluation Process

Evaluation on dissertation progress will be made continually till the end of the process of dissertation presentation according to the standards of the institute.

Section 4. Learning Outcomes, Teaching Strategies and Evaluation

1. Development of Students' Special Characteristics

Special Characteristics	Strategies or Students' Activities
Students must be able to inquire and create new knowledge in the field of applied statistics as well as to apply knowledge into real practice appropriately.	-Students are required to read and criticize the most recent as well as classic academic papers to gain the frontier of knowledge in their own discipline in each coursework. -In each course, the applications of theories and knowledge applied to real practice and case studies are discussed thoroughly. -Students must learn through conducting their own research project with their faculties and advisors' coaching. -Students must write up paper to publish in an international journal. -Upon graduation, students must write their own dissertation and pass their dissertation oral defense.

2. Learning Outcomes Development

Expected Learning Outcome

ELO1: Has moral, academic and profession ethics

ELO2: Know and understand principles and theories related to applied statistics and then able to applied them into reality and practices.

ELO3: Be able to inquire and apply knowledges to cope and to be aligned with work procedures, problems, process improvement.

ELO4: Able to apply knowledge and understanding in related fields to analyze and to solve problems.

ELO5: Be responsible for their own as well as team duty.

ELO6: Be able to use tools, software, and information technology related to own's work and duty.

Thai Qualifications Framework for Higher Education, TQF

TQF 1: Ethics and Moral

TQF 2: Knowledge

TQF 3: Cognitive Skills

TQF 4: Interpersonal skill and responsibility

TQF 5: Numerical analysis, communication, and information technology skills

Expected Learning Outcome		1.	2.	3.	4.	5.
ELO1	Has moral, academic and profession ethics	●	○	○		
ELO2	Know and understand principles and theories related to applied statistics and then able to applied them into reality and practices.	○	●	○	○	○
ELO3	Be able to inquire and apply knowledges to cope and to be aligned with work procedures, problems, process improvement.	○	●	○	○	○
ELO4	Able to apply knowledge and understanding in related fields to analyze and to solve problems.	○	○	●	○	○
ELO5	Be responsible for their own as well as team duty.	○	○	○	●	
ELO6	Be able to use tools, software, and information technology related to own's work and duty.	○	○	○		●

Expected Learning Outcomes (ELO)

Teaching Strategies

	Learning Outcomes					
	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6

Lecture	X	X	X	X	X	X
Discussion	X	X	X	X		X
Case study	X	X	X	X	X	X
Computer-aided instruction		X	X	X	X	X
Practice	X	X	X	X	X	X
Problem-based learning	X	X	X	X	X	X
Study tour	X	X	X	X	X	
Report/Research/Project/Homework	X	X	X	X	X	X

Remark: At least one teaching strategy can be used to achieve each expected learning outcome.

Assessment and Evaluation Strategy

	Expected Learning Outcome					
	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6
Oral examination		X	X	X		X
Activity evaluation for work procedure and role.	X	X	X	X	X	X
Homework/Quiz/Assignments Assessment	X	X	X	X	X	X
Report/Project/Research Assessment	X	X	X	X	X	X
Assessment of students' discussion and presentation		X	X	X		X
Assessment of student's case study analysis, reporting, and group assignment	X	X	X	X	X	X
Class participation/Activity participation	X	X	X	X	X	X
Midterm Examination		X	X	X		X
Final Examination		X	X	X		X
Comprehensive examination		X	X	X		X

Remark: At least one Assessment and Evaluation Strategy can be used to assess/evaluate each expected learning outcome.

3. Curriculum Mapping

● **Main Objective** **Secondary Objective**

Subjects	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6

LC 4003 Advanced Integrated English Language Skill Development		●		●		
LC 6000 Advanced Reading and Writing in English for Graduate Studies		●				
AS 6050 Research methodology	●	●			●	
AS 7150 Mathematical Methods for Statistics		●	●			
AS 7151 Foundations of Probability		●		●		
AS 7152 Advanced Statistical Inference I			●	●		
AS 7153 Linear Models			●			●
AS 7161 Advanced Statistical Inference II		●				
AS 7162 Computer Intensive Statistics				●		●
AS 7163 Theory of Multivariate Statistics		●	●			
AS 7164 Theory of Nonparametric Statistics		●	●			
AS 7165 Applied Time Series Analysis			●		●	●
AS 7166 Statistical Computing		●				●
AS 7166 Bayesian Analysis		●				
AS 7168 Categorical Data Analysis			●			●
AS 7169 Survival Analysis			●		●	
AS 7170 Simulation and Monte Carlo Techniques		●	●			
AS 7171 Sampling Theory			●			
AS 7172 Advanced Experimental Designs			●			●

Subjects	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6

AS 7250 Theory of Actuarial Mathematics		●				
AS 7251 Advanced Loss Distribution and Modeling		●	●			
AS 7252 Advanced Quantitive Risk Management Analytics			●	●		
AS 7253 Statistical Modeling in Finance, Actuarial Sciences, and Risk Management			●		●	●
AS 7261 Advanced non-Life Insurance Mathematics		●	●			
AS 7262 Advanced Life Insurance Mathematics			●	●		
AS 7263 Quantitative Equity Portfolio Management	●		●		●	
AS 7264 Advanced Risk Theory		●				
AS 7265 Simulation Methods and Stochastic Process for Finance, Actuarial Sciences, and Risk Management		●		●		●
AS 7266 Financial Time Series Analysis	●			●		●
AS 7350 Marketing Models		●			●	
AS 7351 Predictive Modeling in Finance			●	●		●
AS 7352 Business Information Visualization		●			●	●
AS 7353 Advanced Big Data Management			●	●		●
AS 7361 Modeling Techniques in Marketing Decision			●		●	●

Subjects	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6
AS 7362 Advanced Analytics and Data Mining Applications		●	●			
AS 7363 Advanced Human Resource		●				●

Analytics						
AS 7364 Advanced Customer Relationship Management Analytics	●		●		●	
AS 7365 Theories and Practices in Social Network and Media Analysis		●		●		
AS 7366 Theories and Practices in Spatial Data Analysis		●			●	
AS 7450 Advanced Transportation Modeling		●	●			
AS 7451 Logistics Systems Analysis		●		●		
AS 7452 Stochastic Processes & Reliability Models		●		●		
AS 7453 Optimization and Applied Operations Research Models			●		●	●
AS 7461 Stochastic Process I		●		●		
AS 7462 Stochastic Process II			●	●		
AS 7463 Mathematical Programming		●				
AS 7464 Integer Programming		●				
AS 7465 Nonlinear Programming		●				
AS 7466 Quantitative Analysis for Logistics and Supply Chain Management			●	●		●
AS 7467 Advanced Logistics Management			●	●		
AS 7468 Network Flows		●				
AS 7469 Inventory Theory		●		●		
AS 7470 Production Planning and Scheduling			●	●		

Subjects	ELO1	ELO2	ELO3	ELO4	ELO5	ELO6
AS 7550 Life Table and Projection Techniques for Population and Policy Research		●	●			●

AS 7551 Population and Development I		●		●		
AS 7552 Thoeries and Models for Project/Program Evaluation	●	●		●		
AS 7553 Advanced Poll and Public Opinion Survey Methodology	●	●			●	●
AS 7561 Population and Development II		●		●		
AS 7562 Theories and Practices in Project Analysis and Feasibility Study		●	●			●
AS 7563 Human Resource Planning and Assessment	●	●			●	
AS 7564 Aging Society	●				●	
AS 7565 Feminism and Development		●				
AS 7566 International Migration and Development		●				
AS 7567 Policy Formulation and Futuristic Research Methods		●		●		
AS 7568 Theories and Practices in System Dynamic Simulation		●				
AS 7569 Qualitative Methods for Policy Research			●	●		
AS 7570 Meta-Analysis for Applied Research		●			●	

Subjects	**ELO1**	**ELO2**	**ELO3**	**ELO4**	**ELO5**	**ELO6**
AS 8001 Seminar in Statistics		●			●	
AS 8002 Seminar in Actuarial Sciences and Quantitative Risk Management		●			●	

AS 8003 Seminar in Business Analytics and Intelligence		●			●	
AS 8004 Seminar in Industrial Statistics, Operation Research, and Logistic Management		●			●	
AS 8005 Seminar in Population and Policy Research Methods for Development		●			●	
AS 8801-8820 Selected Topics in Applied Statistics			●			
AS 9000 Independent Study				●		
AS 9900 Dissertation		●	●	●		

Remark: 1. We do not follow this Office of Higher Education Commission Rules and Regulation here, but we will follow AUN-QA curriculum mapping in an appendix A.

2. The English courses, LC 4003 Advanced Integrated English Language Skill Development and LC 6000 Advanced Reading and Writing in English for Graduate Studies are remedial course. The students shall be exempted from studying this course in accordance with NIDA's criteria on English course exemption.

Section 5. Student Evaluation Guidelines

1. Regulation and Grading Criteria

The grading system for the courses listed in the program conforms to the standard stated in the educational regulations of the National Institute of Development of Administration. Computation of grade point averages will be as follows:

A	=	4.0 (Excellent)
A-	=	3.7 (Very Good)
B+	=	3.3 (Good)
B	=	3.0 (Fairly Good)
B-	=	2.7 (Almost Good)
C+	=	2.3 (Fair)
C	=	2.0 (Almost fair)
C-	=	1.7 (Poor)
D	=	1.0 (Very poor)
F	=	0 (Failure)
W	=	Withdrawal
I	=	Incomplete
S	=	Satisfactory
U	=	Unsatisfactory
AU	=	Audit
P	=	Pass
IP	=	In progress
T	=	Terminate
TR	=	Transfer, work with which there is no comparable grade

2. Standard Verification of Students' Achievement

Verification of students' achievement will be evaluated by the result of standard examination, learning outcomes in each course, qualifying examination, assignment, presentation and the final evaluation at the end of the semester. Adtionally, verification of achievement also made on consideration of thesis/dissertation's advancement.

3. Guidelines for the Completion of the Program

3.1 Students eligible for graduation from the program must have the following qualifications.

3.1.1 Students complete credits and courses as prescribed in the curriculum

3.1.2 A cumulative GPA of at least 3.00 throughout the course

3.1.3 Pass the qualification examination within 2 years after the registration as a student for students of Plan 1.1 and 3 years after the registration as a student for students of Plan 2.1. Students who studied in both plan will be entitled for the qualification examination up to 3 times

3.1.4 Pass the dissertation proposal

3.1.5 Pass the dissertation final examination

3.1.6 Results of the dissertation have been published in international journals listed in the recognized international databases

Section 6. Faculty Development

1. Preparation for New Lecturers

1 . 1 Allocate a supporting budget for encouraging the instructors to broaden their knowledge and experiences to promote teaching and research continually, supporting further education, training, and professional visits to the various academic, attending academic conferences both locally and / or internationally, or taking leave to gain additional experience

1 . 2 Hold a meeting for new lecturers introduction to be known by all lecturers and academic support staffs as well as giving information in detail about all curriculums in the school and all curriculum responsible lecturers.

1.3 New lecturers must attend seminar for curriculum development once a year.

1.4 Appoint lecturer to be responsible lecturer of the curriculum.

1.5 Encourage new lecturers to work on research related to the courses they teach.

1.6 Encourage new lecturers to produce a research work published in academic journals both in national and international level.

2. Knowledge and Skills Development for Lecturers

2.1 Development of Teaching Skills, Assessment and Evaluation

2.1.1 Encouraging the instructors to broaden their knowledge and experiences to promote teaching and research continually supporting further education, training, and professional visits to the various academic, attending academic conferences both locally and / or internationally, or taking leave to gain additional experience

2.1.2 Being a spectator in some courses

2.1.3 Encouraging new lecturers to attend or take part in academic seminars held by the institute or other organizations

2 . 1 . 4 Arranging a meeting for teaching staffs once a year for a common understanding of course's objectives, content, teaching approach, media preparation, documentation and assessment.

2 . 1 . 5 Encouraging lecturers to develop research proposals, produce research works published in international academic journal and present in international conference especially in the topic related to the taught courses.

2.2 Academic and Professional Development

2.2.1 Development such as principles in writing textbooks, research proposals and proposals development

2.2.2 Encouraging lecturers to present a research work for budget allocation in researching.

2.2.3 Arranging an academic seminar for knowledge integration among lecturers

2.2.4 Encouraging for attendance in abroad training in the related field of study

Section 7. Quality Assurance of the Curriculum

1. Standard regulations

Curriculum management is regulated perpetually to be consistent with TQF and AUN-QA or any other professional guidelines and standards (if exist). For instance, the Instructors who are responsible for the curriculum will monitor and advice program's staff to plan the teaching and learning management with Graduate School of Applied Statistics managements. Moreover, program's professors keep track and collect data for curriculum improvement on a yearly basis by carrying out satisfaction evaluation towards curriculum and teaching among newly graduates.

2. Graduates

Quality of program graduates is consistent with TQF including learning outcomes, students'presentation and publications. Besides, program continually set feedback mechanism

from various stakeholders, evaluate curriculum and improve quality, follow up newly graduates' hiring rate, and evaluate stakeholders' satisfaction.

3. Students

Admission process also includes rudimentary course(s) as well as a clear policy for selection ratio and updated selection criteria. Students are supervised for their doctoral dissertation and learning with their own advisee during the office hours.

GSAS facilitates students' learning, researching, and well-being. Graduate School of Applied Statistics monitors and compare qualifying exam passing rate and dropout rate for future improvement.

4. Faculties

Graduate School of Applied Statistics manages and develop faculties since recruitement process. Graduate School of Applied Statistics selects faculties effectively and transparently. Faculties are qualified with knowledge, expertise, and continual academic advancement. Faculties' succession planning is carried out and appropriate student-teacher ratio is regulated. GSAS also monitors, maintains, compares, and develop faculties' numbers and types of faculties' research and publications.

5. Curriculum, teaching, and learner evaluation

Curriculum, course description, and course syllabus are updated regularly as well as learning and teaching in all courses offered is well-planned and improved. Students are assessed and evaluated their performance with various evaluation methods. Curriculum is monitored and managed to be complied with TQF. Expected learning outcomes are clarified and written and should be aligned with NIDA's mission and vision.

Expected learning outcomes reflect stakeholder's demand. Curriculum is designed to facilitate learning to achieve expected learning outcomes. Teaching strategies facilitate life-long learning. Students get their feedback on their performance on time in order to improve themselves.

6. Facilities

The appropriate and sufficient physical and technology facilities and resources are planned and involved by Graduate School of Applied Statistics, program's professors, and NIDA to facilitate the expected learning outcomes. Facilities and resources are evaluated by professors and students for improvement.

There is the clear plan for support staffs' management including competency identification, competency assessment, training, and development in order to facilitate teaching, learning, and researching. Library, resources, computer laboratory, laboratory devices, and infrastructure for information technology are updated and sufficient for learning, teaching, and researching. All facilities' quality and services are evaluated by students and professors perpetually.

7. Key Performance Indicators (KPI)

Thirteen key performance indicators identification is aligned with five TQF's KPI.

Key Performance Indicators	Year 1	Year 2	Year 3	Year 4	Year 5
(1) Having curriculum details according to the Form MOR KHOR OR 2 which meets qualification standards of the disciplines.	×	×	×	×	×
(2) Having at least details of the courses and field experience (if any) according to the Form MOR KHOR OR 3 and 4 before opening for all courses in each semester.	×	×	×	×	×
(3) Report the results of all courses and field experience (if any) according to the Form MOR KHOR OR 5 and 6 within 30 days after the end of semester.	×	×	×	×	×
(4) Report the results of the curriculum according to the Form MOR KHOR OR 7 within 60 days after the end of the academic year.	×	×	×	×	×
(5) Development / improvement of teaching / learning, teaching strategies or assessment of learning outcomes must be performed according to the evaluation report in the Form MOR KHOR OR 7 of last yeasr.		×	×	×	×
(6) Satisfaction level of the final year students / new graduates on the quality of curriculum has an average of at least 3.5 out of 5.0.				×	×
(7) Satisfaction level of graduate users toward new graduates of the program has an average of at least 3.5 out of 5.0.					×
(8) Expected Learning Outcomes (ELO) are assigned for generic skill and specific skill.	×	×	×	×	×
(9) Regulation and description for the program and courses are communicated to stakeholders.	×	×	×	×	×
(10) Courses are designed and arranged in	×	×	×	×	×

Key Performance Indicators	Year 1	Year 2	Year 3	Year 4	Year 5
order to promote Expected Learning Outcomes.					
(11) Teaching and learning strategy is related to and promotes Expected Learning Outcomes.	×	×	×	×	×
(12) Student Evaluation Strategy is related to Expected Learning Outcomes and Teaching and Learning Strategy promotes Expected Learning Outcomes.	×	×	×	×	×
(13) Activities, academic advising and student supports are assigned for promoting Expected Learning Outcomes.	×	×	×	×	×
Total key performance indicators (number)	10	11	11	12	13
Total of must pass indicators (number)	10	11	11	12	13

Section 8. Evaluation and Improvement of Program Administration

1. Evaluation of Teaching Efficiency

1.1 Evaluation of Teaching Strategies

Process of evaluation and revision on planned strategy for teaching development will be considered by the result of evaluation on students by lecturer in the aspect of content comprehension, problem analysis skill. The evaluation will be done by subtests, observation on student's behavior, discussion, and class participation which are collected by teaching evaluation form for an improvement in teaching methodology. Education evaluation of students will be done in the mid-term and final-term for measuring student's content comprehension in the taught course and education development in the future.

1.2 Assessment skills of lecturers in teaching

Such skill assessment can be made by the students in each course, and an assessment for the skills in overall of the curriculum can be made by students who are graduating.

2. Overall Program Evaluation

The overall curriculum evaluation can be done by survey on satisfaction of new graduate toward working related to the part of the objectives of the curriculum, weakness and strength of the curriculum for an improvement of the curriculum, education management in overall courses as follows;

2.1 Evaluation of the curriculum in all courses at the end of academic year

2.2 Evaluation of the curriculum bi-annually

2.3 Participation of students in giving comment toward the curriculum revision in all courses

3. Evaluation of Program Administration

Evaluation is made as accorded in the Section 7 No. 7 by the committee of 3 members composed of at least 1 expert in the field of study.

4. Revisoin of Evaluation Results, Plan to Improve Program and Teaching Strategies

4.1 Evaluation on result in teaching of lecturer in each courses at the end of the semester

4.2 A meeting for Ph.D. Program Committee and students twice an academic year

4.3 Improvement and modernization on course content

4.4 Revision on some courses in the curriculum bi-annually

The strategy is considered in the aspects of academic development, personel development and campaign for drawing interest in the curriculum

Appendix

Comparison of Program Structures and Courses
Between Doctor of Philosophy Program in Statistics (English Program) 2012 and
Doctor of Philosophy Program in Applied Statistics (International Program) 2017

Doctor of Philosophy Program in Applied Statistics (International Program) 2012		Doctor of Philosophy Program in Applied Statistics (International Program) 2017	
Plan 1.1		**Plan 1.1**	
Remedial courses	non credit	Remedial courses	non credit
Core courses	Additional courses	Core courses	Additional courses
Major courses	can be taken as	Major courses	can be taken as
Elective courses	non credit	Elective courses	non credit
Dissertation	48 credits	Dissertation	48 credits
Total	48 credits	Total	48 credits
Plan 2.1		**Plan 2.1**	
Remedial courses	non credit	Remedial courses	non credit
Core courses	3 credits	Core courses	3 credits
Major courses	12 credits	Major courses	12 credits
Elective courses (at least)	3 credits	Elective courses (at least)	9 credits
Dissertation	36 credits	Dissertation	36 credits
Total at least	54 credits	Total at least	60 credits

Courses

Program Revision 2012	Program Revision 2017	Rationale for Revision
Major Statistics	Major Statistics	-
-	AS 6050 Research Methodology	Change core course from AS 6050 Simulation and

Program Revision 2012	Program Revision 2017	Rationale for Revision
		Monte Carlo Techniques to AS 6050 Research Methodology with the emphasis on publication process.
AS 7151 Advanced Theory of Probability	AS 7151 Foundations of Probability	Change code and revise content.
-	AS 7150 Mathematical Methods for Statistics	New course as major course.
AS 7150 Advanced Statistical Theory	AS 7152 Advanced Statistical Inference I	Change code and title and revise content.
AS 7153 Linear Models	AS 7153 Linear Models	-
AS 7602 Theory of Multivariate Statistics	AS 7163 Theory of Multivariate Statistics	Change code.
AS 7603 Theory of Nonparametric Statistics	AS 7164 Theory of Nonparametric Statistics	Change code.
AS 7604 Applied Time Series Analysis	AS 7165 Applied Time Series Analysis	Change code.
AS 7605 Statistical Computing	AS 7166 Statistical Computing	Change code.
AS 7606 Bayesian Analysis	AS 7167 Bayesian Analysis	Change code.
AS 7607 Categorical Data Analysis	AS 7168 Categorical Data Analysis	Change code.
AS 7608 Survival Analysis	AS 7169 Survival Analysis	Change code.
AS 6050 Simulation and Monte Carlo Techniques	AS 7170 Simulation and Monte Carlo Techniques	Change from core course to elective course for statististic major, Change code.
-	AS 7161 Advanced Statistical Inference II	New course as elective course for statistics major.
-	AS 7162 Computer Intensive Statistics	New course as elective course for statistics major.
AS 7601 Sampling Theory	AS 7171 Sampling Theory	Change code.
AS 7152 Advanced Experimental	AS 7172 Advanced Experimental Designs	Change code, change from major course to elective course.
AS 8001 Seminar in Statistics	AS 8001 Seminar in Statistics	-

Program Revision 2012	Program Revision 2017	Rationale for Revision
AS 8801-8809 Selected Topics in Applied Statistics	AS 8801-8820 Selected Topics in Applied Statistics	-
AS 9000 Independent Study	AS 9000 Independent Study	-
AS 9900 Dissertation	AS 9900 Dissertation	-
Major Quantitative Risk Management	**Major Actuarial Sciences and Quantitative Risk Managenent**	Quantitative risk management major has been changed to actuarial sciences and quantitative risk management since these two disciplines must be applied concurrently in the real world settings.
-	AS 6050 Research Methodology	Change core course from AS 6050 Simulation and Monte Carlo Techniques to AS 6050 Research Methodology with the emphasis on publication process.
	AS 7250 Theory of Actuarial Mathematics	New course
AS 7610 Advanced Loss Distribution	AS 7251 Advanced Loss Distribution and Modeling	Change title, change code, and revise content.
AS 7252 Data Analysis for Risk Management Science	AS 7252 Advanced Quantitive Risk Management Analytics	Change title, revise content.
AS 7253 Statistical Modeling in Financial Markets	AS 7253 Statistical Modeling in Finance, Actuarial Sciences, and Risk Management	Change code, change title, revise content.
AS 7611 Advanced non-Life Insurance Mathematics	AS 7261 Advanced non-Life Insurance Mathematics	Change code.
AS 7609 Advanced Life Insurance Mathematics	AS 7262 Advanced Life Insurance Mathematics	Change code.
AS 7251 Quantitative Equity Portfolio Management	AS 7263 Quantitative Equity Portfolio Management	Change code.
	AS 7264 Advanced Risk Theory	New course.
AS 7612 Simulation Methods	AS 7265 Simulation Methods	Change code, change title,

Program Revision 2012	Program Revision 2017	Rationale for Revision
for Risk Management Science	and Stochastic Process for Finance, Actuarial Sciences, and Risk Management	revise content.
AS 7250 Financial Time Series Analysis	AS 7266 Financial Time Series Analysis	Change code.
AS 8002 Seminar in Quantitative Risk Management	AS 8002 Seminar in Actuarial Science and Quantitative Risk Management	Change title and revise content.
AS 8801-8809 Selected Topics in Applied Statistics	AS 8801-8820 Selected Topics in Applied Statistics	-
AS 9000 Independent Study	AS 9000 Independent Study	-
AS 9900 Dissertation	AS 9900 Dissertation	-

Program Revision 2012	Program Revision 2017	Rationale for Revision
Major Business Analytics and Research	**Major Business Analytics and Intelligence**	Business analytics and research major has been revised to Business analytics and intelligence to reflect the integration between applied statistics and information technology as well as to align with current practice in the field of business analytics and intelligence and data sciences.
-	AS 6050 Research Methodology	Change core course from AS 6050 Simulation and Monte Carlo Techniques to AS 6050 Research Methodology with the emphasis on publication process.
AS 7618 Marketing Model	AS 7350 Marketing Models	Change code.
AS 7351 Advanced Data	AS 7351 Predictive Modeling	Change code, change title,

Program Revision 2012	Program Revision 2017	Rationale for Revision
Analysis	in Finance	and revise content to reflect practices and applications.
	AS 7352 Business Information Visualization	New course.
AS 7350 Data Collection and Management	AS 7353 Advanced Big Data Management	Change code, change title, and revise content to reflect practices and applications.
AS 7619 Modeling Techniques in Marketing Decision	AS 7361 Modeling Techniques in Marketing Decision	Change code.
AS 7620 Advanc ed Analytics and Data Mining Applications	AS 7362 Advanced Analytics and Data Mining Applications	Change code.
	AS 7363 Advanced Human Resource Analytics	New course.
	AS 7364 Advanced Customer Relationship Management Analytics	New course.
-	AS 7365 Theories and Practices in Social Network and Media Analysis	New course.
-	AS 7366 Theories and Practices in Spatial Data Analysis	New course.
AS 7352 Program Evaluation	AS 7552 Thoeries and Models for Project/Program Evaluation	Change code, change title, revise content.
AS 7353 Survey Research	AS 7553 Advanced Poll and Public Opinion Survey Methodology	Change code, change title, revise content.
-	AS 7567 Policy Formulation	New course.

Program Revision 2012	Program Revision 2017	Rationale for Revision
	and Futuristic Research Methods	
-	AS 7568 Theories and Practices in System Dynamic Simulation	New course.
-	AS 7569 Qualitative Methods for Policy Research	New course.
AS 7621 Meta-Analysis for Applied Research	AS 7570 Meta-Analysis for Applied Research	Change code, revise content.
AS 8003 Seminar in Business Analytics and Research	AS 8003 Seminar in Business Analytics and Intelligence	Change title and revise content.
AS 8801-8809 Selected Topics in Applied Statistics	AS 8801-8820 Selected Topics in Applied Statistics	-
AS 9000 Independent Study	AS 9000 Independent Study	-
AS 9900 Dissertation	AS 9900 Dissertation	-
Program Revision 2012	**Program Revision 2017**	**Rationale for Revision**
Major Operations Research	**Major Industrial Statistics, Operations Research, and Logistic Systems**	Operations research major has been changed to Industrial Statistics, Operations Research, and Logistic Systems in order to reflect the applications and convergence among these three disciplines.
-	AS 6050 Research Methodology	Change core course from AS 6050 Simulation and Monte Carlo Techniques to AS 6050 Research Methodology with the emphasis on publication process.
	AS 7450 Advanced Transportation Modeling	New course.
	AS 7451 Logistics Systems Analysis	New course.
	AS 7452 Stochastic Processes & Reliability Models	New course.

Program Revision 2012	Program Revision 2017	Rationale for Revision
	AS 7453 Optimization and Applied Operations Research Models	New course.
AS 7617 Organization Performance Measurement	-	Cancelled.
AS 7451 Stochastic Process I	AS 7461 Stochastic Process I	Change code.
AS 7613 Stochastic Process II	AS 7462 Stochastic Process II	Change code.
AS 7450 Mathematical Programming	AS 7463 Mathematical Programming	Change code.
AS 7616 Integer Programming	AS 7464 Integer Programming	Change code.
AS 7453 Nonlinear Programming	AS 7465 Nonlinear Programming	Change code.
	AS 7466 Quantitative Analysis for Logistics and Supply Chain Management	New course.
	AS 7467 Advanced Logistics Management	New course.
AS 7615 Network Flows	AS 7468 Network Flows	Change code.
AS 7452 Inventory Theory	AS 7469 Inventory Theory	Change code.
AS 7614 Production Planning and Scheduling	AS 7470 Production Planning and Scheduling	Change code.
AS 8004 Seminar in Operations Research	AS 8004 Seminar in Industrial Statistics, Operations Research, and Logistic Systems	Change title and revise content.
AS 8801-8809 Selected Topics in Applied Statistics	AS 8801-8820 Selected Topics in Applied Statistics	-
AS 9000 Independent Study	AS 9000 Independent Study	-
AS 9900 Dissertation	AS 9900 Dissertation	-

Program Revision 2012	Program Revision 2017	Rationale for Revision
Major Population and Development	**Major Population and Policy Research Methods for Development**	Population and Development major is radically revised and converted into Population and Policy Research Methods for Development since only demography is not sufficient to solve social and national problem, but public policy, evaluation methods, and research methodology must be integrated to solve them.
-	AS 6050 Research M ethodology	Change core course from AS 6050 Simulation and Monte Carlo Techniques to AS 6050 Research Methodology with the emphasis on publication process.
AS 7622 Mathematical Demography	AS 7550 Life Table and Projection Techniques for Population and Policy Research	Change code, change title, revise content.
AS 7550 Population and Development I	AS 7551 Population and Development I	Change code.
AS 7352 Program Evaluation	AS 7552 Thoeries and Models for Project/Program Evaluation	Change code, change title, revise content.
AS 7353 Survey Research	AS 7553 Advanced Poll and Public Opinion Survey Methodology	Change code, change title, revise content.
AS 7551 Population and Development II	AS 7561 Population and Development II	Change code.
	AS 7562 Theories and Practices in Project Analysis and Feasibility Study	New course.
AS 7624 Manpower Assessment	AS 7563 Human Resource Planning and Assessment	Change code, change title, revise content.

Program Revision 2012	Program Revision 2017	Rationale for Revision
AS 7625 Gerontology	AS 7564 Aging Society	Change code, change title, revise content.
AS 7626 Women and Development	AS 7565 Feminism and Development	Change code, change title, revise content.
AS 7627 Migration and Urbanization	AS 7566 International Migration and Development	Change code, change title, revise content.
	AS 7567 Policy Formulation and Futuristic Research Methods	New course.
	AS 7568 Theories and Practices in System Dynamic Simulation	New course.
	AS 7569 Qualitative Methods for Policy Research	New course.
AS 7621 Meta-Analysis for Applied Research	AS 7570 Meta-Analysis for Applied Research	Change code, change title, revise content.
AS 7351 Advanced Data Analysis	AS 7351 Predictive Modeling in Finance	Change code, change title, revise content.
	AS 7364 Advanced Customer Relationship Management Analytics	New course.
AS 7623 Statistics and Population Research	-	Cancelled.
AS 8005 Seminar in Population and Development	AS 8005 Seminar in Population and Policy Research Methods for Development	Change title and revise content.
AS 8801-8809 Selected Topics in Applied Statistics	AS 8801-8820 Selected Topics in Applied Statistics	-
AS 9000 Independent Study	AS 9000 Independent Study	-
AS 9900 Dissertation	AS 9900 Dissertation	-