

Statistics

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* Courses offered in 2002-03 and before.

^D Course to be offered in 2004-05 and thereafter.

Course Description

(For the course descriptions of all RMS courses, please refer to the Chapter of Risk Management Science. Unless otherwise specified, all are 3-unit term courses of three hours of lecture and one hour of tutorial per week.)

STA 0201

Workshop on Data Exploration and Technical Writing

3 U; 3 STOT; 1st or 2nd term

This course is designed to build students' intuition upon data and fundamental principles of statistics, and to develop skills in technical writing. Students are required to take part in several term projects with emphasis on techniques of data exploration. (For Statistics Majors only.)

STA 0301

Workshop on Data Analysis and Statistical Computing

3 U; 3 STOT; 1st term

This course is designed to strengthen students' ability in statistical computing as well as in processing and analysing data. Students are required to participate in several term projects with emphasis on techniques of data management and analysis. (For Statistics Majors only.)

STA 0303

Case Studies for Business Applications

3 U; 3 STOT; 2nd term

This course is designed to enlighten students with a more comprehensive and in-depth understanding of business statistics through studying example cases. Students are required to carry out several term projects with emphasis on statistical applications in business. (For Statistics Majors only.)

STA 0401

Statistics Projects

3 U; 3 STOT; 1st term

This course is designed to enhance students' competence in integrating and applying statistical techniques in a practical manner. Students are required to conduct several term projects with emphasis on applications. (For Statistics Majors only.)

STA 2001

Basic Concepts in Statistics and Probability I

4 U; 4 Lect. 1 Tut.; 1st term

This course is designed to study the basic concepts of probability and statistics. Topics include elementary probability, Bayes theorem, random variables, distribution and density functions, mathematical expectation, conditional distribution, stochastic independence, correlation, special univariate and multivariate distributions, transformation of random variables, sampling distributions, law of large number, moment generating function and central limit theorem. (For Statistics, Risk Management Science or Quantitative Finance Majors only.)

STA 2003

Computer-aided Statistical Reasoning

1st term

The objective of this course is to help students develop their abilities to judge correctly under uncertainty. The focus of the course is on statistical reasoning. Statistical packages such as Minitab will be used throughout the course for computation and demonstration purposes. Descriptive statistics and statistical graphics will be covered. Important concepts underlying statistical estimation and hypothesis testing will be elucidated and demonstrated using simulation techniques.

STA 2004

SAS for Data Management

2nd term

This course aims at familiarizing students with the capabilities of the Base SAS software for data management. Students will learn SAS programming with emphasis on data storage, data retrieval, data manipulation, data transformation, descriptive analysis, sorting, files merging, file updating, random sampling and data reporting. (For Statistics Majors only.)

STA 2006

Basic Concepts in Statistics and Probability II

4 U; 4 Lect. 1 Tut.; 2nd term

This course covers basic theories in estimation and testing. Topics include point estimation, interval estimation, unbiasedness, maximum likelihood estimation, hypothesis testing and likelihood ratio test. (For Statistics, Risk Management Science or Quantitative Finance Majors only.)

STA 2007

Mathematics with Applications in Statistics I

1st term

This course introduces the mathematical background knowledge for statistics. Topics include vector spaces, basic operations on matrices, simultaneous linear equations, functions, limits, differentiation, integration, Cauchy-Schwarz inequality and infinite series. (For Statistics Majors only.)

STA 2008

Mathematics with Applications in Statistics II

2nd term

This course provides mathematical tools useful in statistics. Topics include eigenvalues, special matrices (partitioned matrices, idempotent matrices, nonnegative definite matrices, etc.), singular value decomposition, multidimensional calculus, Lagrange multipliers, elementary differential and difference equations, parabolic partial differential equations, and Laplace transform. (For Statistics Majors only.)

STA 2009

Introduction to Programming Language for Statistics

1st or 2nd term

This course aims at providing students with basic knowledge of high level programming languages such as C and S-plus. A problem-solving approach will be employed. Algorithm development and implementation with emphasis on examples and applications in statistics will be discussed.

STA 2101

Basic Statistical Concepts and Methods I

1st term

This course introduces basic statistical methods with applications in experimental sciences. Topics include descriptive statistics, the concepts of population and sample, random sampling, basic distributions, point and confidence interval estimations, hypothesis testing and analysis of variance for designed experiments. Topics and examples in relation to correlation, regression, curve-fitting, Hardy-Weinberg equilibrium and Linkage equilibrium will be selected and discussed. The use of related statistical packages will be demonstrated. (Not for Statistics Majors.)

STA 2102

Basic Statistical Concepts and Methods II

2nd term

This course offers basic concepts of statistics. Topics include elementary probability, Bayes theorem, random variables, distribution and density functions, discrete and continuous distributions, sampling distributions, and elementary concepts of estimation and hypothesis testing. (Not for Statistics Majors.)

STA 2103

Statistics in Modern Society

3 U; 3 Lect.; 1st or 2nd term

This course is designed for students who are interested in the applications of statistical methods to real life situations such as opinion polls, clinical trials, gambling and public policy. The objective of the course is to help students become statistically literate and discover the power of statistics and its growing importance in modern society. (Not for Statistics Majors or students who have taken GEE 247N.)

STA 2104

Statistical Reasoning: A Web-based Experience

3 U; 3 Lect ; 1st or 2nd term

Statistics, especially survey data, are frequently misused and misinterpreted. The aim of this course is to equip students with critical perspectives to scrutinize statistical works. The main objectives are as follows: 1) to investigate the role of common sense in understanding statistics; 2) to discuss important features in survey sampling, including sampling schemes and questionnaire design; 3) to introduce the art of data presentation, including popular graphical techniques and statistical report writing; and 4) to examine interesting case studies from typical classes of surveys such as opinion polls and marketing surveys. The pros and cons of using Internet as a means for survey will also be explored. (Not for Statistics Majors or students who have taken GEE 252N.)

STA 3001

Foundation of Financial and Managerial Statistics

1st or 2nd term

This course presents an overview of statistical techniques that lay the foundation for effective applications of statistics in the context of business administration. It covers financial management techniques including investment appraisal, portfolio management and models for assessing stock prices; as well as management techniques including decision analysis under uncertainty, project management, construction and usage of indices, and official statistics in Hong Kong. Selected topics in relation to the applications of multivariate techniques in marketing management will be discussed.

STA 3002

Experimental Design

1st or 2nd term

This course is designed to study various statistical aspects of models in the analysis of variance. Topics include randomization, replication and blocking, randomized blocks, Latin squares and related designs, missing values, incomplete block designs, factorial designs, nested designs and nested-factorial designs, and 2k factorial designs. The use of related statistical packages will be demonstrated.

STA 3003

Survey Methods

1st or 2nd term

This course focuses on the sample design, data analysis and interpretation of survey data. The basic sampling methods covered include simple random sampling, stratified random sampling, clustering sampling, subsampling and double sampling. The underlying method of parameter estimation will be fully discussed for simple random sampling and stratified random sampling. Special estimation techniques including ratio and regression estimations will be introduced in the context of simple random sampling. Analytic treatment of sample size determination, questionnaire design, problem of nonresponse and nonsampling errors will be discussed.

STA 3004

Basic Methods in Biomedical Statistics

1st or 2nd term

This course explores some statistical methods in epidemiological research. Topics are selected from case-control studies, cross-sectional studies, relative risk and odds ratio, attributable risk, matched samples, logistic regression, life-table data analysis, Kaplan-Meier estimates, diagnostic tests, combining evidence from fourfold tables, effects of misclassification errors and agreement among observers.

STA 3005

Applied Nonparametric Statistics

1st or 2nd term

Nonparametric testing and estimation procedures are introduced. Topics include one sample location problem, two sample location problem, two sample dispersion problem, one-way layout, two-way layout, independence problem and regression problems.

STA 3006

Statistical Computing

1st or 2nd term

This course is concerned with the computational aspects of various statistical techniques. Topics include matrix computations, computational methods in multiple linear regression and ANOVA, nonlinear regression and optimization. Prerequisite: CSC 1110 or 1500 or STA 2009.

STA 3007

Applied Probability

1st or 2nd term

This course deals with applied probability and stochastic models with application in industry, engineering and management science. Topics include discrete and continuous time Markov chain, Poisson process, queueing theory, renewal process, replacement problem and elementary reliability theory.

STA 3008

Applied Regression Analysis

4 U; 3 Lect. 1 Lab. 1 Tut.; 1st or 2nd term

This course introduces the general methodology in regression analysis. Topics include least squares method in simple and multiple regression, weighted least squares, diagnostic checkings, variables selection, dummy variables and multicollinearity. A laboratory section will be held to demonstrate the use of related statistical packages and provide students opportunities for hands-on practices.

STA 4002

Multivariate Techniques with Business Applications

1st or 2nd term

This course deals with multivariate statistical techniques and their applications in business. Topics are selected from multivariate normal distribution, analysis of means, profile analysis, MANOVA, partial correlation, multiple and canonical correlations, discriminant analysis, and principal components. The integrated use of these techniques in analysing business problems will be emphasized throughout the course.

STA 4003

Statistical Inference

1st or 2nd term

This course provides an introduction to statistical inference. Topics include statistical models, sampling distributions, asymptotic distributions, sufficiency, maximum likelihood estimation, Bayesian estimation, Rao-Blackwell theorem, Cramér-Rao theorem and the best unbiased estimator, Neyman-Pearson lemma, uniformly most powerful test and general likelihood ratio test.

STA 4004

Actuarial Science

1st or 2nd term

This course covers the basic principles of life contingencies, which is a science for life insurance. Topics include life tables, annuities, assurances, net and gross premiums, reserve, and multiple life theory.

STA 4005

Time Series

1st or 2nd term

This course deals with time series with applications. Fundamental concepts of time series such as trends, stationary process, ARIMA process, model building (including parameter estimation, order determination and diagnostic checking), forecasting and seasonal models, ARCH and GARCH models will be covered. The use of related statistical packages will be demonstrated.

STA 4006

Categorical Data Analysis

1st or 2nd term

This course deals with major statistical techniques in analysing categorical data. Topics include measures of association, inference for two-way contingency tables, loglinear models, logit models and models for ordinal variables. The use of related statistical packages will be demonstrated.

STA 4007

Statistical Quality Control

1st or 2nd term

This course deals with the application of statistical techniques to problems associated with the quality of a product which is produced in large numbers. It covers acceptance sampling plans by attributes, acceptance sampling plans by variables, rectifying inspection, control charts for attributes, and control charts for variables.

STA 4008

Survival Modelling

1st or 2nd term

This course focuses on the modelling of survival data and its applications in actuarial and medical sciences. It covers basic concepts of lifetime distribution, various types of censoring, and methods to analyse censored data using non-parametric, parametric and semi-parametric models. Emphases are on the construction of the likelihood functions, parameter estimation and hypothesis testing.

STA 4009

Workshop on Marketing Survey

1st or 2nd term

This course adopts a workshop approach that scrutinizes the process of marketing surveys. Group projects will be the major ingredients of the course that familiarize students with the entire survey process from problem formulation to report writing. Internet surveys will also be included. Interesting case studies will be presented and discussed.

Study Scheme

I. Major Programme

A. Applicable to students admitted in 2002-03 and thereafter

There are two streams of specialization: the stream of *Applied Statistics* and the stream of *Data Science and Business Statistics*. A student's selected stream will be printed on his/her transcript. All students are under the stream of *Applied Statistics* unless they apply at their second year of attendance to specialize in the stream of *Data Science and Business Statistics* and select certain courses as prescribed below.

Applied Statistics Stream

Students are required to complete a minimum of 66-69 units of courses as follows:

- | | | |
|------|---|-------------|
| (i) | Required Courses (Please see Notes 1 and 2):
STA 0201, 0301, 0303, 0401, 2001, 2003, 2004, 2006,
2007, 2008, 2009 and 3008 | 36-39 units |
| (ii) | Elective Courses (Please see Note 3):
Ten courses from the following (with at least five from
Statistics coded 4000 or above or RMS 4003, 4004, 4005):
STA 3001, 3002, 3003, 3004, 3005, 3006, 3007, 4002,
4003, 4004, 4005, 4006, 4007, 4008, 4009, RMS 4001 [#] ,
4002 [#] , 4003 [#] , 4004 [#] , 4005 [#] | 30 units |

Total: 66-69 units

[#] to be included in the Major GPA as well

Recommended course pattern

<i>First Year of Attendance</i>	23-26 units
STA 0201, 2001, 2003, 2004, 2006, 2007, 2008 and 2009	
<i>Second Year of Attendance</i>	22 units
STA 0301, 0303, 3008 and four elective courses	
<i>Third Year of Attendance</i>	21 units
STA 0401 and six elective courses	

Total: 66-69 units

Data Science and Business Statistics Stream

Students are required to complete a minimum of 66-69 units of courses as follows:

- | | | |
|------|---|-------------|
| (i) | Required Courses (Please see Notes 1 and 2): | 51-54 units |
| | STA 0201, 0301, 0303, 0401, 2001, 2003, 2004, 2006, 2007, 2008, 2009, 3001, 3008, 4004, 4005, 4008 and 4009 | |
| (ii) | Elective Courses (Please see Note 3): | 15 units |
| | Five courses from the following (with at least two from Statistics coded 4000 or above or RMS 4004): | |
| | STA 3002, 3003, 3004, 3005, 3006, 3007, 4002, 4003, 4006, 4007, RMS 4004 [#] | |

Total: 66-69 units[#] *to be included in the Major GPA as well***Recommended course pattern**

<i>First Year of Attendance</i>	23-26 units
STA 0201, 2001, 2003, 2004, 2006, 2007, 2008 and 2009	
<i>Second Year of Attendance</i>	22 units
STA 0301, 0303, 3001, 3008 and three elective courses	
<i>Third Year of Attendance</i>	21 units
STA 0401, 4004, 4005, 4008, 4009 and two elective courses	

Total: 66-69 units**B. Applicable to students admitted in 2001-02**

Students are required to complete a minimum of 66-69 units of courses as follows:

- | | | |
|------|--|-------------|
| (i) | Required Courses (Please see Notes 1 and 2): | 36-39 units |
| | STA 0201, 0301, 0302, 0401, 2001, 2003, 2004, 2006, 2007, 2008, 2009 and 3008 | |
| (ii) | Elective Courses (Please see Note 3): | 30 units |
| (a) | Four courses from STA 3002, 3003, 3004, 3005, 3006, 3007, RMS 4001 [#] , 4002 [#] | |
| (b) | Six courses from STA 4001, 4002, 4003, 4004, 4005, 4006, 4007, 4008, RMS 4003 [#] , 4004 [#] , 4005 [#] | |

Total: 66-69 units[#] *to be included in the Major GPA as well***Recommended course pattern**

<i>First Year of Attendance</i>	23-26 units
STA 0201, 2001, 2003, 2004, 2006, 2007, 2008 and 2009	
<i>Second Year of Attendance</i>	22 units
STA 0301, 0302, 3008 and four elective courses from STA 3002, 3003, 3004, 3005, 3006, 3007, RMS 4001, 4002	
<i>Third Year of Attendance</i>	21 units
STA 0401 and six elective courses from STA 4001, 4002, 4003, 4004, 4005, 4006, 4007, 4008, RMS 4003, 4004, 4005	

Total: 66-69 units

Notes: Applicable to students admitted in 2001-02 and thereafter

1. All Major students should obtain Grade "D" or above in each of the courses of STA2001,2003,2004,2006,2007,2008,2009 and 3008. Otherwise, they are required to repeat the course(s). Students who cannot meet the Grade "D" requirement in any one of the courses mentioned above after two attempts will be required to withdraw from the University. Please refer to Reg. 15.2(d) of the General Regulations Governing Full-time Undergraduate Studies.
2. Statistics Majors who have obtained Grade "B" or above in "Pure Mathematics" in the HKALE* will be exempted from STA 2007. For those students, the minimum requirement is 66 units of Major courses.
3. Major students minoring in Risk Management Science are required to declare which Risk Management Science courses will be counted towards the fulfilment of the requirements of the Minor programme in Risk Management Science at their final term of attendance.

* *Only applicable to students admitted on the strength of HKALE results. The HKALE results to be deemed acceptable for course exemption purpose must be obtained in that particular sitting of HKALE which the University has used to assess the admission qualification of the student concerned.*

2. Minor Programme

Students are required to complete a minimum of 18 units of courses as follows:

- | | | |
|------|---|-------------|
| (i) | Required Courses:
STA 2101, 2102 | 6 units |
| (ii) | Elective Courses: | 12-13 units |
| | (a) Two courses from STA 3002, 3003, 3004, 3005, 3006, 3007, 3008, RMS 4001, 4002 | |
| | (b) Two courses from STA 4001, 4002, 4003, 4004, 4005, 4006, 4007, 4008, RMS 4003, 4004, 4005 | |
| | <hr style="width: 100%;"/> | |
| | Total: | 18-19 units |

- Notes:
1. Students may take DSE 2020, ECO 2121, GRM 2102 (GEO 2102), SOC 2042 or any other course approved by the Department of Statistics as a substitute for STA 2101 to fulfil the Minor programme requirement.
 2. Students may take any course approved by the Department of Statistics as a substitute for STA 2102 to fulfil the Minor programme requirement.
 3. Mathematics Majors may take MAT 4240 as a substitute for STA 3007 to fulfil the Minor programme requirement.
 4. Risk Management Science Majors or Quantitative Finance Majors may take STA 2001 as a substitute for STA 2101 and 2006 as a substitute for STA 2102 to fulfil the Minor programme requirement specified in (i). A maximum of two courses which count towards the fulfilment of these students' respective Major programme requirements can also be counted towards the fulfilment of the Minor programme requirement specified in (ii).
 5. Courses which count towards the fulfilment of a student's Risk Management Science Minor programme requirement cannot be counted towards the fulfilment of the Minor programme requirement specified in (ii).

3. Faculty Language Requirement

(Please refer to the "Faculty Language Requirement" of Faculty of Science for details.)