Statistics and Actuarial Science

A. For postgraduate students admitted in August 2023 and thereafter:
   - 3 compulsory courses & 3 elective courses

B. For postgraduate students admitted in July 2023 or before:
   - 4 compulsory courses & 1 elective course

A. Departmental Coursework Requirement 2024-25
(For RPG students enrolled in August 2023 and thereafter)

Course Code	Course Title	Compulsory (C)/ Elective (E)
SSAF6001*	Basic Laboratory Safety Course for RPg Candidate in the Faculty of Science	C
STAT6003	Research Postgraduate Seminar	C
STAT6018	Research Frontiers in Data Science	C
Students are required to choose 3 courses from the following:		
STAT6005	Special Studies in Statistics	E
STAT6008	Advanced Statistical Inference	E
STAT6009	Research Methods in Statistics	E
STAT6010	Advanced Probability	E
STAT6011	Computational Statistics and Bayesian learning	E
STAT6025	Special Studies in Machine Learning	E

B. Departmental Coursework Requirement 2022-23
(For RPG students enrolled in July 2023 or before)

Course Code	Course Title	Compulsory (C)/ Elective (E)
SSAF6001*	Basic Laboratory Safety Course for RPg Candidate in the Faculty of Science	C
STAT6003	Research Postgraduate Seminar	C
STAT6008	Advanced Statistical Inference	C
STAT6009	Research Methods in Statistics	C
~~STAT6019~~	~~Current Topics in Statistics~~	~~C~~
Students are required to choose 1 course from the following in the first semester:		
STAT6005	Special Studies in Statistics	E
STAT6010	Advanced Probability	E
STAT6011	Computational Statistics and Bayesian learning	E

* Starting from the academic year 2010-11, SSAF6001 "Basic Laboratory Safety Course for RPg Candidates in Faculty of Science" will be made compulsory to students with the following registration dates (MPhil candidates registered on or after January 1, 2009), (3-year PhD candidates registered on or after January 1, 2008) & (4-year PhD candidates registered on or after January 1, 2007).

Departmental Course Details

The minimum mark for final exams for all RPGs is 50.
The passing mark for the departmental courses (STAT6XXX) taken by RPGs is 55.

The following courses are mainly designed for RPG students with strong statistical background. Students without sufficient statistical trainings (e.g., non-statistical majors) are advised to consult with the course instructors before registration.

STAT6003 Research postgraduate seminar (COMPULSORY)
(only offered to RPG in Department of Statistics & Actuarial Science)

STAT6005 Special studies in statistics
The aim of the course is to introduce students to the statistical topics which are of relevance to their research study but have not been taken previously. Students will be instructed to attend one course or a combination of courses from the department as prescribed by the supervisor(s) and approved by the Chairman of the Departmental Research Postgraduate Committee. Alternately this course may consist of supervised reading supplemented by written work and prescribed coursework.

Students are permitted to replace this course by another RPG course from the MPhil/PhD curricula offered by other Departments, subject to the approval of the Departmental Research Postgraduate Committee.

Assessment: to be determined.

STAT6008 Advanced statistical inference
This course covers the advanced theory of point estimation, interval estimation and hypothesis testing. Using a mathematically-oriented approach, the course provides a formal treatment of inferential problems, statistical methodologies and their underlying theory. It is suitable in particular for students intending to further their studies or to develop a career in statistical research. Contents include: (1)Decision problem – frequentist approach: loss function; risk; decision rule; admissibility; minimaxity; unbiasedness; Bayes' rule; (2)Decision problem – Bayesian approach: prior and posterior distributions, Bayesian inference; (3) Estimation theory: exponential families; likelihood; sufficiency; minimal sufficiency; completeness; UMVU estimators; information inequality; large-sample theory of maximum likelihood estimation; (4) Hypothesis testing: uniformly most powerful (UMP) test; monotone likelihood ratio; UMP unbiased test; conditional test; large-sample theory of likelihood ratio; confidence set; (5) Nonparametric inference; bootstrap methods.

Assessment: One 2-hour written examination; 40% coursework, 60% examination.

STAT6009 Research methods in statistics

This course aims to provide graduate students with a strong foundation in statistical concepts and methods essential for their research degree in statistics. The course covers a range of topics, including set theory, measure theory, independence, modes of convergence, the law of large numbers, central limit theory, probability models, principles of data reduction, unbiased estimation, maximum likelihood estimation (MLE), delta-method, quantiles, U-Statistics, bootstrap, jackknife, Bayesian rules, empirical Bayes, and statistical functionals. Undergraduate students interested in pursuing a research degree in statistics may also enroll in this course.

Assessment: One 2-hour written examination; 40% coursework, 60% examination.

STAT6010 Advanced probability
This course provides an introduction to measure theory and probability, with focus on mathematical concepts in probability important for students to conduct research in probability, statistics and
actuarial science. Contents include sigma-algebra, measurable spaces, measures and probability measures, measurable functions, random variables, integration theory, characteristic functions, modes of convergence of random variables, conditional expectations, martingales.

Assessment: one 2-hour written examination; 40% coursework, 60% examination.

STAT6011 Computational statistics and Bayesian learning

This course aims to give students an introduction on modern computationally intensive methods in statistics, with a strong focus on Bayesian methods. The role of computation as a fundamental tool in data analysis and statistical inference will be emphasized. The course will introduce topics including the generation of random variables, optimization techniques, and numerical integration using quadrature and Monte Carlo methods. This course will then cover the fundamental Bayesian framework, including prior elicitation, posterior inference and model selection. For posterior computation, Monte Carlo methods such as importance sampling and Markov chain Monte Carlo will be introduced. Methods for approximate inference such as variational Bayes will also be covered. Advanced Bayesian modeling with nonparametric Bayes will then be explored, with applications in machine learning. This course is particularly suitable for students who intend to pursue further studies or a career in research.

Assessment: One 2-hour written examination; 50% coursework, 50% examination.

STAT6018 Research Frontiers in Data Science

This course aims to equip postgraduate students with the latest knowledge and practical skills in data science and relevant domains, in order to enhance their research capabilities. The course comprises of different modules and guest lectures, with topics encompassing: 1) big data analytics; 2) machine learning; 3) image processing and computer vision; 4) high-dimensional data analysis; 5) statistical methods and their applications in medical research; 6) time series econometrics; 7) data analytics in actuarial science; and 8) other areas as determined by the instructor.

Assessment: 100% coursework

STAT6025 Special studies in machine learning

The aim of the course is to introduce students to the machine learning topics which are of relevance to their research study but have not been taken previously. Students will be instructed to attend one course or a combination of courses from the department as prescribed by the supervisor(s) and approved by the Chairman of the Departmental Research Postgraduate Committee. Alternately this course may consist of supervised reading supplemented by written work and prescribed coursework.

Students are permitted to replace this course by another RPG course from the MPhil/PhD curricula offered by other Departments, subject to the approval of the Departmental Research Postgraduate Committee.

Assessment: to be determined