**THE EDUCATION UNIVERSITY OF HONG KONG**

**Course Outline**

**Part I**

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**Programme Title :** Master of Arts in Mathematics and Pedagogy

**Programme QF Level :** 6

**Course Title :** Probability and Statistics

**Course Code :** MTH6130

**Department :** Mathematics and Information Technology

**Credit Points :** 3

**Contact Hours :** 39

**Pre-requisite(s) :** Nil

**Medium of Instruction :** English supplemented with Chinese

**Course Level :** 6

**Part II**

The University’s Graduate Attributes and seven Generic Intended Learning Outcomes (GILOs) represent the attributes of ideal EdUHK graduates and their expected qualities respectively. Learning outcomes work coherently at the University (GILOs), programme (Programme Intended Learning Outcomes) and course (Course Intended Learning Outcomes) levels to achieve the goal of nurturing students with important graduate attributes.

In gist, the Graduate Attributes for Undergraduate, Taught Postgraduate and Research Postgraduate students consist of the following three domains (i.e. in short “PEER & I”):

* **P**rofessional **E**xcellence;
* **E**thical **R**esponsibility; **&**
* **I**nnovation.

The descriptors under these three domains are different for the three groups of students in order to reflect the respective level of Graduate Attributes.

The seven GILOs are:

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| 1. Problem Solving Skills |
| 2. Critical Thinking Skills |
| 3. Creative Thinking Skills |
| 4a. Oral Communication Skills |
| 4b. Written Communication Skills |
| 5. Social Interaction Skills |
| 6. Ethical Decision Making |
| 7. Global Perspectives |

1. **Course Synopsis**

This course aims at introducing students to the basics of statistics, including standard probability distributions, sampling distributions, parameter estimations, inference and statistical decision based on hypothesis testing. This course provides an introductory overview of probability and statistics. The basics of random variables are introduced. With these basics in place, concepts of sampling distributions and techniques of data analysis and hypothesis testing are then introduced and discussed.

1. **Course Intended Learning Outcomes** (CILOs)

*Upon completion of this course, students will be able to:*

CILO1 Develop the concepts of sampling distributions

* + - * 1. understand some standard probability distributions and their properties
        2. understand the probabilistic meanings of these distributions
        3. demonstrate the calculus of random variables

CILO2 Make inference on the population by observing and analyzing sample data

1. demonstrate their ability in estimating population parameters based on the sample statistics
2. based on the estimates in (1), make statistical inference of the population

CILO3 Make statistical decisions by using the results of hypothesis testing

1. understand the nature of hypothesis testing and the associated errors
2. perform hypothesis testing to solve simple decision problems
3. **Content, CILOs and Teaching & Learning Activities**

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| **Course Content** | **CILOs** | **Suggested Teaching & Learning Activities** |
| Descriptive statistics: pie charts, bar charts, histograms, etc.; elementary statistics of data including mode, mean, median, standard deviation, mean deviation and range; five number summary of data; Box plots. | *CILO1* | Lectures, group discussions, and on-line learning. |
| The theory of counting: the multiplication rule, permutations, combinations; | *CILO1* |
| Probability and probability distribution: sample spaces; events; postulates of probability; principle of total probability; discrete and continuous random variables; mean and variance; Binomial, Poisson and Normal distributions; approximating Binomial probabilities using Normal distributions; | *CILO1* |
| Sampling distributions related to the Normal distribution; Student’s t, χ2 and F distributions; weak law of large number; the central limit theorem; | *CILO1* |
| Estimation: point estimators; unbiased estimators; mean square error; confidence intervals of mean, variance and proportion; | *CILO2* |
| Decision making: hypothesis testing between means; analysis of variance; χ2 test for contingency tables; regression and prediction. | *CILO3* |

1. **Assessment**

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| **Assessment Tasks** | | **Weighting (%)** | **CILO** |
| (a) | One assignment which requires students to demonstrate their knowledge and skills of performing fundamental statistical analysis | 20 | *CILO1,2,3* |
| (b) | A group project which requires students to apply a set of relevant statistical concepts and skills to analyse real-world data, summarize the result in a report, and give a short presentation of the analysis. | 30 | *CILO1,2,3* |
| (c) | An examination to test students' understanding of the concepts and skills of fundamental statistical analysis | 50 | *CILO1,2,3* |

1. **Required Text(s)**

Nil

1. **Recommended Readings**

Capiński, M., Zastawniak, T. (2003). *Probability through problems*. New York: Springer.

DasGupta, A. (2010). *Fundamentals of probability: a first course*. New York: Springer.

Devore, J.L., Kenneth N.B. (2011). *Modern Mathematical Statistics with Applications*. Springer.

Ghahramani, S. (2004). *Fundamentals of probability* (3rd ed.). Upper Saddle River, N. J.: Prentice Hall.

Grinstead, C., Snell, J.L. (2002). *Introduction to probability* (2nd ed.). Providence, R. I.: American Mathematical Society.

Hogg, R. V., McKean, J. W. & Craig, A. T. (2013). *Introduction to mathematical statistics* (7th ed.).Boston: Pearson.

Lipschutz, S., Lipson, M. (2000). *Schaum’s Outline of Theory and Problems of Probability*. McGraw-Hill.

Pestman, W.R. (1998). *Mathematical Statistics: An Introduction*. New York: Walter de Gruyter.

Pestman, W.R., Alberink, I.B. (1998). *Mathematical Statistics: Problems and Detailed Solutions*. New York: Walter de Gruyter.

Rees, D.G. (2001). *Essential Statistics* (4th ed.). Boca Raton, FL: Chapman & Hall.

Ross, S. (2014). *A first course in probability* (9th ed.). Upper Saddle River, N. J.: Prentice Hall.

Spiegel, M.R., Srinivasan, R.A, Schiller, J.J. (2000). *Schaum’s Outline of the Theory and Problems of Probability and Statistics*. (2nd ed.). McGraw-Hill.

Tijms, H. (2004). *Understanding probability: chance rules in everyday life*. New York: Cambridge University Press.

Walpole, R.E., Myers, R.H., Myers, S.L., Ye, K. (2011). *Probability and Statistics for Engineers and Scientists* (9th ed.). Pearson International Edition.

陳希孺(2000)。《機會的數學》。北京, 淸華大學出版社廣州, 曁南大學出版社。

陳毅恒、梁沛霖 (2006)。《R軟件操作入門》。 中國統計出版社。

張文忠 (1999)。《機率統計問題精選詳解》。 中央圖書出版社。

李華剛、廖俊傑、邵慰慈 (1997)。《統計學入門》。 香港敎育圖書公司。

唐國慶、范曉玲 (2003)。《簡明教育統計學》。 長沙市, 湖南大學出版社。

黃義雄(2005)。《機率與統計》。 台北市, 五南圖書出版股份有限公司。

1. **Related Web Resources**

Nil

1. **Related Journals**

Australian Journal of Statistics

Chance

Journal of Statistics Education

Statistics Surveys

The American Statistician

The Journal of Royal Statistical Society – Series A

The Statisticians

1. **Academic Honesty**

The University adopts a zero tolerance policy to plagiarism. For the University’s policy on plagiarism, please refer to the *Policy on Academic Honesty, Responsibility and Integrity with Specific Reference to the Avoidance of Plagiarism by Students* (<https://www.eduhk.hk/re/modules/downloads/visit.php?cid=9&lid=89>). Students should familiarize themselves with the Policy.

1. **Others**

Nil

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