UNIVERSITY OF KENT

Faculty of Science, Technology & Medical Studies

MA862: PROBABILITY, INFERENCE AND MULTIVARIATE ANALYSIS

Module Description

1. **Title of Module**. MA862, Probability, Inference and Multivariate Analysis
2. **Department**. Institute of Mathematics, Statistics and Actuarial Science
3. **Start Date**. Immediate
4. **Number of students**. About 12 students
5. **Modules to be withdrawn**. None. This is an existing module.
6. **Level of Module**. Postgraduate (level M)
7. **Number of credits**. 25
8. **Term**. Both teaching terms
9. **Prerequisite and co-requisite modules**. This module is taken by all students registered for MSc or Postgraduate Diploma in Statistics. The other modules (MA853, MA858, MA854, MA855, MA856, MA857) are co–requisites.
10. **Programme of study**. MSc and Postgraduate Diploma in Statistics
11. **Subject–specific learning outcomes**.

    On successful completion of the module students

    - will have a systematic understanding of probability and statistical inference, and will be able to use a comprehensive range of relevant concepts and principles [A1, A4, B1, B2];
    - will be able to select and apply these to solve advanced problems in probability and statistical inference, using a variety of methods [B2, C1, C2];
    - will be able to summarise and interpret multivariate data effectively [C2];
    - will have a critical awareness of the logical link between multivariate techniques and corresponding univariate techniques [A2];

– will be able to undertake a wide range of univariate and multivariate calculations and manipulations, and to communicate the results effectively to statisticians [C1, C2, C4].

12. **Generic learning outcomes**.

On successful completion of the module, students

– will have developed a logical, mathematical approach to their work [A5, B4];

– will have developed the ability to solve challenging problems [D1].

On successful completion of the module, students will also have improved their key skills in numeracy, problem solving and information technology.

13. **Curriculum**.

– **Probability**. Events, discrete and continuous random variables, sequences of random variables, convergence, joint distributions, generating functions, including characteristic function.

– **Classical inference**. Sampling distributions, concepts in point estimation, exponential family, likelihood, maximum likelihod; issues in confidence intervals and in hypothesis tests.

– **Bayesian inference**. Prior to posterior analysis, conjugacy, predictive distributions; Bayesian equivalents to classical methods.

– **Multivariate analysis**. Multivariate normal, sampling distributions, inference from mutivariate normal random samples, multivariate analysis of variance; discriminant analysis; principal component analysis and factor analysis; canonical analysis; metric and non–metric scaling; cluster analysis.

14. **Indicative reading list**.

Feller, W. (1968). *An introduction to probability theory and its application, 3rd ed*. New York, Wiley.

Bickel, P. J., and Doksum, K. A. (2001) *Mathematical statistics: basic ideas and selected topics. Vol 1 2nd ed*. London, Prentice–Hall.

Mardia, K. V., Kent, J. T., and Bibby, J. M. (1979). *Multivariate analysis*. London, Academic Press.

Sharma, S. (1996). *Applied multivariate analysis*. New York, Wiley.

15. **Learning and teaching methods**. The module comprises about 50 hours of lectures, with computer–based illustrations included as appropriate. Several exercise sheets are set and discussed. The coursework gives students practice in solving problems, and allows the opportunity for students to attempt material less suited to conventional

closed–book examinations, including computer–based calculations and data interpretation. Students will also have the opportunity to solve exercises in which they have to select the most appropriate approach to problems, which will assist in developing self–study skills.

16. **Assessment methods and how these relate to testing achievement of the intended learning outcomes**. This module is assessed by coursework and by a single three–hour closed–book examination in Term 3. Examination questions are designed to test the learning outcomes outlined in Section 11. Coursework consists of selected exercises from those set during the module, and aims particularly to test outcomes less suited to conventional closed–book examinations, including computer–based calculations and data interpretation. Coursework contributes 20% to the weight and the examination contributes 80%.

17. **Implications for learning resources**. This is an existing module, and there are no special resource implications.

18. **Students with disabilities**. Students with disabilities will not have any non–justifiable disadvantage in taking this module.

Statement by the Director of Learning and Teaching: 'I confirm I have been consulted on the above module proposal and have given advice on the correct procedures and required content of module proposals'

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Director of Learning and Teaching Date

Statement by the Head of Department: 'I confirm that the Department has approved the introduction of the module and will be responsible for its resourcing'

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Head of Department Date