**UNIVERSITI TEKNOLOGI MARA**

**ASC456: RISK MODELING**

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| **Course Name (English)** | RISK MODELING APPROVED |
| **Course Code** | ASC456 |
| **MQF Credit** | 4 |
| **Course Description** | This course provides a further grounding in mathematical and statistical techniques of particular relevance to financial work. This course follows the syllabus of Core Statistics 2 (CS2) from Institute and Faculty of Actuaries (IFoA) United Kingdom. |
| **Transferable Skills** | - Demonstrate ability to identify and articulate self skills, knowledge and understanding confidently and in a variety of contexts.<br>- Demonstrate ability to analyse issues/problems from multiple angles and make suggestions. |
| **Teaching Methodologies** | Lectures |
| **CLO** | CLO1 Apply concepts and methods to solve problems related to risk modelling.<br>CLO2 Develop and use problem-solving techniques in relation to risk modelling.<br>CLO3 Demonstrate lifelong learning skills in assignments related to risk modelling. |
| **Pre-Requisite Courses** | No course recommendations |

| **Topics** |
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| **1. Bayesian Statistics**<br>1.1) Bayes' theorem<br>1.2) Prior and posterior distributions<br>1.3) The loss function |
| **2. Credibility Theory**<br>2.1) Credibility<br>2.2) Bayesian Credibility<br>2.3) Empirical Bayes credibility theory: Model 1<br>2.4) Empirical Bayes credibility theory: Model 2 |
| **3. Loss Distribution**<br>3.1) Statistical distribution for modelling individual and aggregate losses<br>3.2) Proportional and excess of loss reinsurance<br>3.3) Estimation and goodness of fit |
| **4. Risk Models**<br>4.1) Models for short term insurance contracts<br>4.2) The collective risk model<br>4.3) The individual risk model<br>4.4) Parameter variability |
| **5. Copulas**<br>5.1) Marginal and joint distributions<br>5.2) Gaussian copula<br>5.3) Archimedean family of copulas<br>5.4) Concordance and tail dependence |
| **6. Extreme Value Theory**<br>6.1) Generalized extreme value distribution<br>6.2) Generalized Pareto distribution<br>6.3) Measure of tail weight |

| Assessment Breakdown | % |
|---|---|
| Continuous Assessment | 30.00% |
| Final Assessment | 70.00% |

**Details of Continuous Assessment**

| Assessment Type | Assessment Description | % of Total Mark | CLO |
|---|---|---|---|
| Assignment | Group of 3 students | 5% | CLO3 |
| Quiz | Quiz 1 | 2% | CLO1 |
| Quiz | Quiz 2 | 3% | CLO2 |
| Test | Test 1 | 10% | CLO1 |
| Test | Test 2 | 10% | CLO2 |

**Reading List**

**Recommended Text**

- **Institute and Faculty of Actuaries (IFoA) UK 2019, *Core Reading for the 2020 Exams - CS2 Risk Modelling and Survival Analysis*, Institute and Faculty of Actuaries (IFoA) UK United Kingdom**
- **Gray, R.J.; Pitts 2012, *Risk modelling in general insurance: from principles to practice*, S.M. Cambridge University Press [ISBN: 978-052186394]**
- **Stuart A. Klugman,Harry H. Panjer,Gordon E. Willmot 2019, *Loss Models*, 5th Ed., 19, Wiley United Kingdom [ISBN: 9781119523789]**

**Reference Book Resources**

- **Gray, R.J.; Pitts 2012, *Risk modelling in general insurance: from principles to practice*, S.M. Cambridge University Press [ISBN: 978-052186394]**
- **Daykin, C. D.; Pentikainen, T.; Pesonen 1994, *Practical risk theory for actuaries*, M. Chapman & Hall [ISBN: 978-041242850]**
- **Tse, Y-K 2009, *Non-life actuarial models: theory, methods and evaluation*, Cambridge University Press [ISBN: 978-052764650]**
- **Hossack, I. B.; Pollard, J. H.; Zehnwirth, B 1999, *Introductory statistics with applications in general insurance*, 2nd ed Ed., Cambridge University Press [ISBN: 978-052165534]**
- **Jon Danielsson 2011, *Financial Risk Forecasting*, Wiley [ISBN: 9780470669433]**
- **Dobson, A. J. 1983, *An introduction to statistical modelling*, Chapman & Hall [ISBN: 978-041224860]**
- **Marius Hofert (Author), Ivan Kojadinovic (Author, Contributor), Martin Mächler (Author, Contributor), Jun Yan (Author, Contributor) 2018, *Elements of Copula Modeling with R (Use R!)*, 1st Ed., Springer Switzerland [ISBN: 978-331989634]**

**Article/Paper List**

This Course does not have any article/paper resources

**Other References**

- **Casualty Actuarial Society E-Forum, Spring 2016 Alan Chalk, FIA, MSc, and Conan McMurtrie MSc, 2016, Alan Chalk, FIA, MSc, and Conan McMurtrie MSc 2016, *A Practical Introduction to Machine Learning Concepts for Actuaries* https://www.casact.org/pubs/forum/16spfo rum/Chalk_McMurtrie.pdf**
- **ASTIN Bulletin, 47(3) Joan Del Castillo, Jalila Daoudi and Isabel Serra 2017, *The full tails gamma distribution applied to model extreme values* https://doi.org/10.1017/asb.2017.9**