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| **Module Code** | STU22004 |
| **Module Name** | Applied Probability I |
| **ECTS Weighting[[1]](#footnote-1)** | 5 ECTS |
| **Semester taught** | Semester 1 |
| **Module Coordinator/s** | Dr. Bahman Honari |
| [**Module Learning Outcomes**](https://www.tcd.ie/TEP/Council/assets/TEP%20Embedding%20Trinity%20Graduate%20Attributes%20in%20the%20Curriculum%202.pdf) | On successful completion of this module, students will be able to:   1. To analyse problems by means of a Monte Carlo approach 2. To formalise and solve probability problems 3. To use the language of random variables, their expected values and their probability distributions 4. To use conditional distributions 5. To deal with special families of probability distribution 6. To understand the concepts involved in simple and linear regression analysis Third learning outcome 7. To start learning R as programming language for Statistics/Probability |
| **Module Content** | • Generation of random permutations  • Frequentist probability  • Axiomatic foundations of probability  • Derivation of basic rules of probability from axioms  • Independence of events  • Conditional probability  • Law of conditional probability, Bayes theorem  • Random variables and their distributions  • Expectation and its properties  • Independent random variables  • Transformations of random variables, Connection between distributions  • Special families of discrete and continuous distributions  • Markov inequality and Chebyschev inequality  • Joint probability mass function, Marginal distributions  • Covariance and correlation  • Simple linear regression model  • Monte Carlo approach  • Empirical Law of Large Numbers  • True and pseudo random number generation |
| **Teaching and Learning Methods** | Lectures, laboratories and tutorials.  Lecture and Tutorial hours: 33, Lab hours: 5. |
| **Assessment Details[[2]](#footnote-2)** | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Assessment Component** | **Brief Description** | **Learning Outcomes Addressed** | **% of total** | **Week set** | **Week due** | | Final Exam | Written Exam | All but LO 7 | 80% | NA | NA | | Project | Lab Project | All | 20% | 9 | 12 | |  |  |  |  |  |  | |  |  |  |  |  |  | |  |  |  |  |  |  | |  |  |  |  |  |  | |
| **Reassessment Requirements** | 100% written exam |
| **Contact Hours and Indicative Student Workload** | |  |  |  | | --- | --- | --- | | Contact Hours (lectures, labs, tutorials, meetings, etc.) | | 38 hours | | Independent study (outside scheduled contact hours), broken down by: | | 32 hours | |  | preparation for classes and review of materials | 10 hours | |  | completion of assessments (including examination, if applicable) | 22 hours | | Total Hours | | 70 hours | |
| **Recommended Reading List** | Tijms, “Understanding Probability”, Cambridge 2012  Additional material will be provided when needed |
| **Module Pre-requisites** | **Prerequisite modules:** CSU11001 and CSU11002 (or MA1E01 and MA1E02)  **Other/alternative non-module prerequisites:** N/A |
| **Module Co-requisites** | N/A |
| **Module Website** | Blackboard / mymodule.tcd.ie |
| **Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.** | N/A |
| **Date of last update** | 28/08/2019 by Bahman Honari |

1. [TEP Glossary](https://www.tcd.ie/TEP/Council/assets/TEP%20Glossary%20Edition%201%20Decemeber%20circulation1.pdf) [↑](#footnote-ref-1)
2. [TEP Guidelines on Workload and Assessment](https://www.tcd.ie/TEP/Council/assets/TEP%20Instructions%20for%20Using%20the%20student%20workload%20mapping%20tool%201.pdf) [↑](#footnote-ref-2)