<table>
<thead>
<tr>
<th>Module Code</th>
<th>STU22004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Name</td>
<td>Applied Probability I</td>
</tr>
<tr>
<td>ECTS Weighting¹</td>
<td>5 ECTS</td>
</tr>
<tr>
<td>Semester taught</td>
<td>Semester 1</td>
</tr>
<tr>
<td>Module Coordinator/s</td>
<td>Dr. Bahman Honari</td>
</tr>
</tbody>
</table>

**Module Learning Outcomes**

On successful completion of this module, students will be able to:

- **LO 1.** To analyse problems by means of a Monte Carlo approach
- **LO 2.** To formalise and solve probability problems
- **LO 3.** To use the language of random variables, their expected values and their probability distributions
- **LO 4.** To use conditional distributions
- **LO 5.** To deal with special families of probability distribution
- **LO 6.** To understand the concepts involved in simple and linear regression analysis
  - Third learning outcome
- **LO 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 Chebyshev 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.

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¹ TEP Glossary
### Assessment Details

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Brief Description</th>
<th>Learning Outcomes Addressed</th>
<th>% of total</th>
<th>Week set</th>
<th>Week due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam</td>
<td>Written Exam</td>
<td>All but LO 7</td>
<td>80%</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Project</td>
<td>Group Project</td>
<td>All</td>
<td>20%</td>
<td>13</td>
<td>18</td>
</tr>
</tbody>
</table>

### 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:
  - 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
- 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

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2 TEP Guidelines on Workload and Assessment