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| Module Code | EEU33E03 |
| Module Name | PROBABILITY AND STATISTICS |
| ECTS Weighting¹ | 5 ECTS |
| Semester taught | Semester 2 |
| Module Coordinator/s | Asso. Prof. Bidisha Ghosh (Coordinator), Dr. Senad Bulja. |
| Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline | <p>On successful completion of this module, students should be able to:</p> <p>LO1. Develop detailed understanding of data types, visualisation, data summarisation and exploratory data analyses</p> <p>LO2. Compute probabilities for a variety of random variable applicable especially to engineering problems</p> <p>LO3. Construct and apply mathematical descriptions of discrete and continuous probability distributions</p> <p>LO4. Assess the results of statistical tests applying the concepts of hypothesis testing</p> <p>LO5. Performing correlation and regression analysis</p> <p>LO6. Utilise statistical software for carrying out data analyses</p> <p>Graduate Attributes: levels of attainment</p> <p>To act responsibly - Enhanced</p> <p>To think independently - Enhanced</p> <p>To develop continuously - Enhanced</p> <p>To communicate effectively - Introduced</p> |
| Module Content | <p>This module will provide basic knowledge of mathematical probability theory and the techniques of statistical inference that are used for analysing data.</p> <p>Indicative syllabus:</p> <p><i>Data description:</i> Data Visualisation, Histogram, Measures of Central Tendency, Measures of Variation, Range, IQR and Finding Outliers, Graphs and Exploratory Data Analysis</p> <p><i>Probability and probability distributions:</i> Basic theory of probability, Discrete probability distributions (Bernoulli and Binomial Experiments, Multinomial Experiments, Geometric, Hypergeometric, Negative Binomial and Negative Multinomial, Poisson Distribution), Continuous probability distributions (Density Curves, Moments, Normal Distribution, Exponential Distribution, Chi-squared Distribution)</p> |

¹ [TEP Glossary](#)

Sampling Theory:

Sampling distributions of means, proportions, differences of means, differences of proportions, variances and ratios of variances. The Central Limit Theorem. Concept of standard error.

Statistical Inference:

Estimation, point estimates and confidence intervals, Significance tests: null and alternative hypotheses, test statistic, level of significance, p-value. Z-tests, t-tests, F-tests, chi-square tests, paired comparisons.

Regression and Correlation:

Simple linear regression, method of least squares, coefficient of determination, confidence intervals and prediction intervals, correlations coefficient, significance tests in regression and correlation, time-series analyses

Teaching and Learning Methods

Lectures: The teaching strategy follows a set of well-established textbooks provided in the reference. This subject has been well developed for teaching at this level, so student accessibility and consistency of notation is easily established.

Tutorials: The tutorials are designed to support students in the preparation of weekly homework assignments with example questions and possible solutions. Ten weekly homework assignments are comprised of two parts: 1. Randomised practise tests (unmarked) & 2. Randomised Real Tests (marked). Each home-work assignment is worth 3% per week.

Assessment Details²

Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

| Assessment Component | Assessment Description | LO Addressed | % of total | Week due |
|--------------------------|------------------------------|--------------|-------------------|-------------|
| Written exam | End of semester examination | LO1-5 | 70 | Exam period |
| Tutorials (1hr per week) | Weekly home-work assignments | LO1-6 | 20% (2% per week) | Wk2-12 |
| Group Project | Group assignment | LO1-6 | 10% (2 projects) | Wk 5, Wk12 |

Reassessment Requirements**Contact Hours and Indicative Student Workload²**

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| Contact hours: 44hrs (33 lectures, 10 tutorials) |
| Independent Study (preparation for course and review of materials): 51hrs |

² [TEP Guidelines on Workload and Assessment](#)

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| | Independent Study (preparation for assessment, incl. completion of assessment): 30hrs |
| Recommended Reading List | Applied Statistics and Probability for Engineers by Douglas C. Montgomery and George C. Runger Fundamentals of Statistics: Informed Decisions Using Data Paperback by Michael Sullivan III |
| Module Pre-requisite | MEU11E14, EEU22E12 |
| Module Co-requisite | None |
| Module Website | |
| Are other Schools/Departments involved in the delivery of this module? If yes, please provide details. | No |
| Module Approval Date | |
| Approved by | Prof Naomi Harte |
| Academic Start Year | 2025/26 |
| Academic Year of Date | 2026 |