Module Code	EEU11E21
Module Name	Probability, Statistics and Data Centric Engineering
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Asst. Prof. Arman Farhang (Coordinator), Prof. Nicola Marchetti
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: LO1. Develop detailed understanding of data types, visualisation, data summarisation and exploratory data analyses LO2. Compute probabilities for a variety of random variable applicable especially to engineering problems LO3. Construct and apply mathematical descriptions of discrete and continuous probability distributions LO4. Assess the results of statistical tests applying the concepts of hypothesis testing LO5. Performing correlation and regression analysis LO6. Model trends in a set of data using a least squares straight line fit both manually and using modern computational software LO7. Utilise statistical software for carrying out data analyses **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Enhanced To develop continuously - Enhanced To communicate effectively – Introduced
Module Content	This module will provide basic knowledge of mathematical probability theory and the techniques of statistical inference that are used for analysing data. Indicative syllabus: *Data description:* Data Visualisation, Histogram, Measures of Central Tendency, Measures of Variation, Range, IQR and Finding Outliers, Graphs and Exploratory Data Analysis *Probability and probability distributions:* 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,

[1] TEP Glossary

Moments, Normal Distribution, Exponential Distribution, Chi-squared Distribution)
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 Details[2]
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	LO1-6	70	Exam period
Tutorials (1hr per week)	Weekly home-work assignments	LO1-6	20% (2% per week)	Wk2-12
Group Project	Group assignment	LO1-7	10% (2 projects)	Wk 5, Wk11

Reassessment Requirements

[2] TEP Guidelines on Workload and Assessment

Contact Hours and Indicative Student Workload[2]	**Contact hours:** 44hrs (33 lectures, 10 tutorials) **Independent Study (preparation for course and review of materials):** 51hrs **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, Global Edition** by Michael Sullivan III **Statistics for Engineers and Scientists (5th Edition)** by William Navidi
Module Pre-requisite	MEU11E01, MAU11E02 (for revision of integration)
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	Naomi Harte
Academic Start Year	2025
Academic Year of Date	2025/26