Module Specification

Probability Theory and Mathematical Statistics [TSI]

Version: 2023-24, v3.0, 09 Aug 2023

Contents

Part 1: Information

Module title: Probability Theory and Mathematical Statistics [TSI]

Module code: UFCFWW-12-1

Level: Level 4

For implementation from: 2023-24

UWE credit rating: 12

ECTS credit rating: 6

College: College of Arts, Technology and Environment

School: CATE School of Computing and Creative Technologies

Partner institutions: Transport and Telecommunication Institute

Field: Computer Science and Creative Technologies

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: To acquaint students with theoretical foundations of probability theory and mathematical statistics and prepare them for construction and application of probabilistic models and empirical analysis of statistical data.

Outline syllabus: Introduction to probability and statistics. Random experiments and random events. Operations with random events.

Probability space. Classical, geometrical, and statistical definitions of probability.

Probability of sum and product of random events. Conditional probability. Dependent and independent events.

The law of total probability. Bayes’s rule.

Bernoulli trials, Bernoulli formula. Approximation: de Moivre-Laplace and Poisson theorems.

Random variables and their distributions.

Numerical characteristics of random variables: expected values, variance, moments, quartiles.

Discrete distributions: binomial, geometrical, Poisson.

Continuous distributions: uniform, exponential, normal.

Multivariate distributions. Theoretical covariance and correlation.

Law of large numbers in Bernoulli and Chebyshev's forms. The central limit theorem.

Mathematical statistics: main objectives and tasks. Descriptive statistics. Sampling.

Statistical estimation. Point estimates and their properties: unbiasedness, efficiency, consistency.

Interval estimates.

Testing of statistical hypotheses: the general algorithm, hypotheses about the

expected value and the distribution law

Fundamentals of the sample correlation analysis.

Part 3: Teaching and learning methods

Teaching and learning methods: Learning and teaching will be provided to students in two forms: lectures and labs. During lectures, theoretical aspects of the course will be provided to students by the teaching staff. Lectures will be supported by presentation published and available to the students on e.tsi.lv under the module section. Also, the course includes additional materials, like textbooks, publications on the internet, videos etc.

During practical calculus classes, students receive a set of practical problems for every topic to perform. Several practical problems are explained during classes by a teaching assistant, while other problems are provided as a homework.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Able to obtain, analyse and use the information to formulate, explain and competently discuss problem-solving approaches.

MO2 Apply core theoretical foundations of statistical data analysis to design and develop data analytics, machine learning, and artificial intelligence solutions for real-world problems.

MO3 Understand the probabilistic problems in application areas and state them in a proper mathematical form and preparedness for practical application of probability theory and mathematical statistics to professional problems.

MO4 Use software for probabilistic simulation and statistical data processing.

MO5 Apply concepts of discrete and continuous random variables and have a skill of random variable construction and application.

Hours to be allocated: 120

Contact hours:

Face-to-face learning = 64 hours

Total = 64

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/D3BCD907-EA5F-548A-3E0E-C6E0C1068380.html?lang=en-gb&login=1

Part 4: Assessment

Assessment strategy: To assess the learning outcomes of this course, several types of activities are provided, which include
1) Portfolio - probability calculus includes solutions for a set of problems on every topic within the module.
2) performing practical / laboratory work - snippets of code which can be used to solve a series of given problems.
3) In-class test - Practical probability calculus, Proof of course theorems.
4) examination - 2h closed-book exam of theoretical questions. Students are expected to demonstrate their knowledge of most important terms, laws, and algorithms as well as understanding of general concepts of probability theory

Automated tests are used as a formative type of knowledge assessment and are designed for continuous self-assessment of the knowledge acquired by the student. This will allow students to pay attention to material that they have not mastered enough.

Resits will be like for like.

Assessment tasks:

Practical Skills Assessment (First Sit)

Description: Source codes and supplementary reports on computer labs. Includes a set of problems for every topic and expected to be conducted by students independently and assessed by the teaching assistant within specified deadlines.
Weighting: 30 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO4

Portfolio (First Sit)
Description: Homework on probability calculus includes solutions for a set of problems on every topic and expected to be conducted by students independently and assessed by the teaching assistant within specified deadlines.
Weighting: 20 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO3, MO5

In-class test (First Sit)
Description: Practical probability calculus, Proof of course theorems. (2 hours)
Weighting: 20 %
Final assessment: No
Group work: No
Learning outcomes tested: MO3

Examination (First Sit)
Description: written closed-book exam (2 hours) of theoretical questions. Students are expected to demonstrate their knowledge of most important terms, laws, and algorithms as well as understanding of general concepts of probability theory.
Weighting: 30 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO5

Practical Skills Assessment (Resit)

Description: A series of tasks finding the solutions to a set a problems covering probability calculus as well as other topics covered within this module. students are required to include Source codes and supplementary reports on computer labs
Weighting: 30 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO4

Examination (Resit)
Description: written closed-book exam (2 hours) of theoretical questions. Students are expected to demonstrate their knowledge of most important terms, laws, and algorithms as well as understanding of general concepts of probability theory.
Weighting: 30 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO5

In-class test (Resit)
Description: Practical probability calculus, Proof of course theorems. (2 hours)
Weighting: 20 %
Final assessment: No
Group work: No
Learning outcomes tested: MO3

Portfolio (Resit)
Description: Homework on probability calculus includes solutions for a set of problems on every topic and expected to be conducted by students independently and assessed by the teaching assistant within specified deadlines.
Weighting: 20 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO3, MO5

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Computer Science and Software Development {Double Degree} {Foundation} [TSI] BSc (Hons) 2022-23

Computer Science and Software Development {Double Degree} [Feb][PT][TSI][5yrs] BSc (Hons) 2021-22

Computer Science and Software Development {Double Degree} [Oct][PT][TSI][5yrs] BSc (Hons) 2021-22