1.	**Field of study**	**Mathematics**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2024/2025 (winter term)
4.	Level of qualifications/degree	first-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	**General information about the module**
Module name	**Probability Theory**
Module code	W4-MT-S1-24-RPra
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	Moduł Rachunek prawdopodobieństwa ma na celu wykształcenie umiejętności swobodnego posługiwania się podstawowymi pojęciami i narzędziami rachunku prawdopodobieństwa w zakresie teorii zmiennych losowych i ich rozkładów. Przewiduje się realizację następujących treści programowych: 1. Pojęcie przestrzeni probabilistycznej (model klasyczny, model geometryczny i inne), własności miary probabilistycznej, prawdopodobieństwo warunkowe i całkowite, wzór Bayesa, niezależność zdarzeń, lemat Borela-Cantellego. 2. Pojęcie zmiennej losowej, jej rozkładu i parametrów rozkładu (dystrybuanta, wartość oczekiwana, wariancja, odchylenie standardowe, momenty). 3. Przykłady zmiennych losowych o rozkładach dyskretnych i absolutnie ciągłych. 4. Nierówności związane z momentami. 5. Rozkład borelowskich przekształceń jednowymiarowej zmiennej losowej. 6. Zmienne losowe wielowymiarowe i ich rozkłady. 7. Macierz kowariancji, współczynnik korelacji. 8. Niezależność zmiennych losowych. 9. Rozkład sumy i iloczynu niezależnych zmiennych losowych. 10. Rodzaje zbieżności ciągów zmiennych losowych: słaba, stochastyczna, prawie na pewno. 11. Centralne twierdzenia graniczne i prawa wielkich liczb: zastosowania do szacowania prawdopodobieństw.
List of modules that must be completed before starting this module (if necessary)	not applicable

8. Learning outcomes of the module

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
RPra_1	Zna główne pojęcia i twierdzenia z teorii prawdopodobieństwa.	K_U01 K_U11 K_W02 K_W03	5 3 2 3

		K_W04 K_W05	4 4
RPra_2	Potrafi konstruować odpowiednie do opisów modele probabilistyczne i definiować zmienne losowe.	K_U01 K_U11 K_W04	4 3 3
RPra_3	Potrafi wyznaczać dystrybuantę zmiennej losowej o danym rozkładzie (dyskretnym lub absolutnie ciągłym). Znając dystrybuantę zmiennej losowej potrafi wyznaczać jej rozkład.	K_U01 K_U03 K_U11 K_W04	4 3 3 3
RPra_4	Potrafi obliczać wartość oczekiwaną i wariancję zmiennych losowych.	K_U01 K_U03 K_U11 K_W04	4 3 3 3
RPra_5	Zna warunki na niezależność zmiennych losowych i potrafi ją weryfikować.	K_U01 K_U03 K_U11 K_W04	4 3 3 3
RPra_6	Potrafi wyznaczać rozkłady funkcji zmiennych losowych, w szczególności rozkład sumy niezależnych zmiennych losowych.	K_U01 K_U03 K_U11 K_W04	4 3 3 3
RPra_7	Zna i potrafi wykorzystać prawa wielkich liczb i centralne twierdzenie graniczne.	K_U01 K_U03 K_U11 K_W04	2 2 2 2

9. Methods of conducting classes

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture *a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and*

		turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem
d02	Programmed learning methods	Working with a programmed textbook *working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.*
e01	Practical methods	Laboratory exercise / experiment *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment*
f02	Methods of self-learning	Individual work with a text *searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue*

10. Forms of teaching

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
01	lecture	30	exam	RPra_1, RPra_2, RPra_3, RPra_4, RPra_5, RPra_6, RPra_7	a01, a05, b04
02	discussion classes	15	course work	RPra_1, RPra_2, RPra_3, RPra_4, RPra_5, RPra_6, RPra_7	a05, b04, d02, e01, f02

11. The student's work, apart from participation in classes, includes in particular:

Code	Category	Name (description)	Is it part of the BUNA?
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a03	Preparation for classes	Developing practical skills *activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)*	No
a04	Preparation for classes	Consulting materials complementary to those indicated in the syllabus *agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation*	Yes
b01	Consulting the curriculum and the organization	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	Yes

	of classes		
b02	Consulting the curriculum and the organization of classes	Verification / adjustment / discussion of syllabus provisions *consulting the content of the syllabus, possibly in the presence of the year tutor or members of the class group, and, if necessary, reassessing the provisions concerning special conditions for class participation, e.g., space and time requirements, technical and other requirements, including conditions for participation in classes outside the walls of the university, classes organized in blocks, organized online, etc.*	Yes
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	Yes
c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: https://usosweb.us.edu.pl.