COURSE FRAMEWORK – PROBABILITIES AND STATISTICS

GENERAL INFORMATION

COURSE TITLE				COURSE NUMBER
Probability and Statistics / Probabilités et statistique				201-SN1-RE
PROGRAM CODE AND TITLE				**PROGRAM COMPONENT**
200.B1 Science and 200.C1 Computer Science and Mathematics				Program-specific (Pre-U)
PREREQUISITES	**SEMESTER**	**PONDERATION**	**TOTAL CONTACT HRS**	**TOTAL HOMEWORK HRS**
	1-2	2-1-2	45	30

COURSE'S ROLE IN THE PROGRAM

Briefly describe the course and situate it within the context of the program by explaining its relationship with other courses.

This introductory course in probabilities and statistics serves as a foundational element in a pre-university science program. Covering descriptive statistics, basic probabilistic laws, inferential statistics, and linear correlation, students acquire essential quantitative skills crucial for subsequent science courses. This course will allow students to develop a solid statistical understanding vital for scientific inquiry and data-driven decision-making in various scientific disciplines.

COURSE-LEVEL LEARNING OUTCOME

Learning outcomes are observable, measurable actions that demonstrate students' learning (i.e., the attainment of the competencies and transversal learning). Learning outcomes should be descriptive statements expressed with action verbs. They must reflect the level of learning expected of students taking the course—a level which is determined by the course competency(ies). Consulting a taxonomy (such as Bloom's) is useful for developing appropriately leveled learning outcome statements.

The course-level learning outcome is a concise expression of the learning students will develop in the course. It aligns with the statement(s) of the course competency(ies). It is a descriptive statement expressed with (an) action verb(s) and is typically a sentence or two in length.

Learn how to apply statistical methods and probability concepts to solve problems within the natural sciences.

KEY LEARNING OUTCOMES

Identify approximately 3 to 6 key learning outcomes that demonstrate student learning in this course. They should lead to the course-level learning outcome. (Note: each key learning outcome should be addressed by an assessment.)

Students will be able to:

1) Use descriptive statistical methods to process data.
2) Use probability concepts in situations with random outcomes.
3) Use statistical inference methods to characterize a population.
4) Determine the nature and intensity of the relationship between two variables

LEARNING INTEGRATION ASSESSMENT (LIA)
The LIA would be two non-cumulative tests, with one scaffolding the other. The LIA would be worth 50-60% of the final grade with the last test worth no more than 30%. The two tests are not integrated since one would cover probability, and one would cover inferential statistics.
EVALUATION CRITERIA FOR THE LEARNING INTEGRATION ASSESSMENT
List the key criteria by which students will be assessed for this activity. Take into consideration the key learning outcomes for the course. This section is not a marking rubric. The final exam (LIA) will be evaluated according to the performance criteria from the ministerial devis at the end of this document.

Indicate in the box, the percentage of the final grade that the LIA will be worth.

WEIGHT OF GRADE (%)
50% to 60%

COMPETENCIES AND TRANSVERSAL LEARNING				
CODE	COMPETENCY STATEMENT	PROGRESSION	HOURS	OTHER COURSES CARRYING THE COMPETENCY
0M01	Solve problems related to the natural sciences using statistical methods and probability and probability concepts	Comprehensive	45	
CODE	COMPETENCY STATEMENT	PROGRESSION	HOURS	OTHER COURSES CARRYING THE COMPETENCY
		Choose an item.		

Transversal learning is not explicitly mentioned in the course competency(ies) but is needed across different disciplines in the program (e.g. professional attitudes and essential skills such as communication, research, and ICT skills). It may be mapped to multiple courses. (See, for example the Aims of College Education and the Common Competencies of College Education.)

- Critical thinking, problem solving and logical reasoning
- Note-taking and study skills
- Communication skills
- Consistency and rigour in problem-solving, and justification of the approach used
- See connections between mathematics, science and technology through an interdisciplinary approach to certain problems

STUDENT PROFICIENCY IN THE LANGUAGE OF INSTRUCTION (SPLI)

Student proficiency in the language of instruction is the ability to write, read, speak, and listen in order to communicate effectively at the college level. SPLI may also require discipline-specific vocabulary, documentation, and communication skills; assessment of language skills must account for a minimum of 10% of any take-home written assignment or oral presentation in which English is the language of expression.

Indicate how SPLI is applied in this course (e.g., how much written expression will be worth in take home or oral presentation assignments).

In general, mathematics assessments do not require extensive use of English by the student. Instead, students primarily use symbolic manipulations and graphical representations to solve problems. When students use English, they typically use it only in isolated words or sentence fragments. However, when a substantive written report or oral presentation is evaluated, the SPLI policy will apply to the evaluation of that component.

PEDAGOGICAL STRATEGIES AND ASSESSMENTS

Describe how students will develop their learning and how that learning will be assessed in the course.

- *Key formative, summative, or integrative assessments (Note: each key learning outcome should be addressed by an assessment.)*
- *Key learning activities*
- *Pedagogical strategies that support learning in this course*

You may also make recommendations to support your colleagues in teaching the course. For example, you may choose to include concise descriptions of the following:

- *Suggestions for real-world contexts for activities or assessments that help support learning*
- *Suggestions for sequencing of main steps or stages of learning*
- *Suggestions for course materials agreed on by the department*

- Lectures
- Classwork (individual or collaborative)
- Homework
- Audio-visual material (Desmos, GeoGebra, Wolfram, et cetera)
- Quizzes (oral or written)
- Assignments (online or written)
- Class tests: teachers are welcome to give another test in addition to the two outlined in the LIA. So 3 non-cumulative tests worth 60-75% total is possible.
- A cumulative final exam was not chosen, to avoid students having 4 science finals in 1 semester.

APPENDIX 1 – EXCERPT OF THE MINISTERIAL *DEVIS:*

Code: 0M01

Objective	*Standard*
Statement of the Competency	**Performance Criteria for the Competency as a Whole**
Solve problems related to the natural sciences using statistical methods and probability concepts.	• Correct use of mathematical terminology and syntax • Appropriate use of necessary computer and statistical tools • Algebraic manipulation in accordance with established rules
Elements of the Competency	**Performance Criteria**
1. Use descriptive statistical methods to process data.	• Appropriate use of statistical vocabulary • Appropriate representation of a frequency distribution in the form of a table or graph • Appropriate calculation of measures of central tendency, variability and position • Accurate interpretation of tables, graphs and measurements
2. Use probability concepts in aleatory situations.	• Correct use of counting techniques [1] • Exact calculation of the probability of an event [2] • Accurate probability distribution of discrete and continuous variables • Correct resolution of problems involving the laws of probability [3]
3. Use statistical inference methods to characterize a population.	• Accurate recognition of conditions for applying the Central Limit Theorem • Accurate interpretation of the margin of error • Appropriate estimation by confidence interval [4] • Correct use of hypothesis testing [5] • Correct resolution of problems calling for the use of statistical inference methods
4. Determine the nature and intensity of the relationship between two variables.	• Accurate determination of the equation of the regression line • Accurate interpretation of the coefficients [6] • Correct resolution of problems involving the concept of a regression line • Accurate determination of the dependency relationship between two qualitative variables • Correct resolution of problems involving the chi-square test of independence

Learning Activities	
Discipline:	Mathematics
Weighting:	2-1-2
Credits:	1 ⅔
Periods of instruction:	45
Indications:	

Additional information on content:

[1] Counting techniques: permutations, arrangements and combinations

[2] Probability of an event: probabilities of dependent events, probabilities of independent events, conditional probabilities

[3] Laws of probability: binomial distribution and normal distribution

[4] Estimation of a confidence interval using the:
- mean of a large sample ($n \geq 30$)
- mean of a small sample ($n < 30$)
- proportion of a large sample ($n \geq 30$)

[5] Hypothesis test using the:
- mean of a large sample ($n \geq 30$)
- mean of a small sample ($n < 30$)
- proportion of a large sample ($n \geq 30$)

[6] Coefficients: linear correlation coefficient and coefficient of determination

Code : 0M01

Objectif	*Standard*
Énoncé de la compétence	**Critères de performance liés à l'ensemble de la compétence**
Résoudre des problèmes liés aux sciences de la nature par l'utilisation de méthodes statistiques et de concepts de probabilités.	• Utilisation correcte de la terminologie et de la syntaxe mathématiques. • Utilisation appropriée des outils informatiques et statistiques requis. • Manipulations algébriques conformes aux règles établies.

Éléments de la compétence	**Critères de performance**
1. Utiliser des méthodes de statistiques descriptives pour traiter des données.	• Utilisation appropriée du vocabulaire propre à la statistique. • Représentation appropriée d'une distribution de fréquences sous forme de tableau et de représentation graphique. • Calcul approprié de mesures de tendance centrale, de dispersion et de position. • Interprétation juste des tableaux, des graphiques et des mesures.
2. Utiliser des concepts de probabilités dans des situations aléatoires.	• Utilisation correcte de techniques de dénombrement. [1] • Calcul exact de la probabilité d'un événement. [2] • Distribution juste de probabilités de variables discrètes et continues. • Résolution correcte de problèmes faisant intervenir les lois de probabilité. [3]
3. Utiliser des méthodes d'inférence statistique pour caractériser une population.	• Reconnaissance correcte des conditions d'application du théorème central limite. • Interprétation juste de la marge d'erreur. • Estimation appropriée par un intervalle de confiance. [4] • Utilisation correcte d'un test d'hypothèse. [5] • Résolution correcte de problèmes faisant intervenir les méthodes d'inférence statistique.
4. Déterminer la nature et l'intensité du lien entre deux variables.	• Détermination juste de l'équation de la droite de régression. • Interprétation juste des coefficients. [6] • Résolution correcte de problèmes faisant intervenir le concept de droite de régression. • Détermination juste d'un lien de dépendance entre deux variables qualitatives. • Résolution correcte de problèmes faisant intervenir le test d'indépendance du khi-carré.

Activités d'apprentissage	
Discipline :	Mathématique
Pondération :	2-1-2
Unités :	1 ⅔
Périodes d'enseignement :	45
Précisions :	

Précisions supplémentaires sur les contenus

[1] Techniques de dénombrement : permutations, arrangements et combinaisons.

[2] Probabilité d'un événement : probabilités d'événements dépendants, probabilités d'événements indépendants, probabilités conditionnelles.

[3] Lois de probabilité : loi binomiale et loi normale.

[4] Estimation par un intervalle de confiance sur :
- une moyenne d'un échantillon de grande taille ($n \geq 30$);
- une moyenne d'un échantillon de petite taille ($n < 30$);
- une proportion d'un échantillon de grande taille ($n \geq 30$).

[5] Test d'hypothèse sur :
- une moyenne d'un échantillon de grande taille ($n \geq 30$);
- une moyenne d'un échantillon de petite taille ($n < 30$);
- une proportion d'un échantillon de grande taille ($n \geq 30$).

[6] Coefficients : coefficient de corrélation linéaire et coefficient de détermination.

APPENDIX 2 – COURSE DESCRIPTION

This course provides a foundational understanding of descriptive statistics, probabilistic laws, and inferential techniques. It will help students develop data analysis skills for informed decision-making in scientific contexts.

Ce cours offre une compréhension fondamentale des statistiques descriptives, des lois de probabilités et des techniques inférentielles. Il aidera les étudiants à développer des compétences en analyse de données pour prendre des décisions éclairées dans des contextes scientifiques.