National University of Engineering (UNI)
School of Computer Science
Syllabus 2026-I

1. COURSE

ST251FCCS. Probability Calculation (Mandatory)

2. GENERAL INFORMATION

2.1 Course	:	ST251FCCS. Probability Calculation
2.2 Semester	:	3^{rd} Semester
2.3 Credits	:	3
2.4 Horas	:	2 HT; 2 HP;
2.5 Duration of the period	:	16 weeks
2.6 Type of course	:	Mandatory
2.7 Learning modality	:	Face to face
2.8 Prerrequisites	:	None

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

Probability calculus is fundamental in computer science for algorithm analysis, system modeling, and decision-making under uncertainty. This course introduces the basic concepts of probability, including random variables, probability distributions, and important theorems like Bayes' theorem.

5. GOALS

- Understand the fundamentals of probability calculus.
- Apply probability rules to solve problems.
- Analyze different probability distributions and their applications.

6. COMPETENCES

1) Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions. (Assessment)

6) Apply computer science theory and software development fundamentals to produce computing-based solutions. (Assessment)

AG-C07) Computing Knowledge: Applies appropriate knowledge of mathematics, science, and computing. (Assessment)

AG-C12) Applies computer science theory and software development fundamentals to produce computer-based solutions. (Assessment)

7. TOPICS

Unit 1: Introduction to Probability (6 hours)	
Competences Expected: 1,6,AG-C07	
Topics	**Learning Outcomes**
• Sample spaces and events. • Definition of probability. • Conditional probability and independence. • Bayes' theorem.	• Define sample spaces and events. [Familiarizarse (*Familiarity*)] • Calculate probabilities of events. [Usar (*Usage*)] • Apply Bayes' theorem to calculate conditional probabilities. [Evaluar (*Assessment*)]
Readings : [Ros14], [Dev16]	

Unit 2: Discrete Random Variables (8 hours)	
Competences Expected: 1,6,AG-C07	
Topics	**Learning Outcomes**
• Discrete random variables. • Discrete probability distributions (Bernoulli, binomial, Poisson). • Expectation and variance.	• Define discrete random variables and their distributions. [Familiarizarse (*Familiarity*)] • Calculate the expectation and variance of discrete random variables. [Usar (*Usage*)] • Apply discrete distributions to model problems. [Evaluar (*Assessment*)]
Readings : [Ros14], [Dev16]	

Unit 3: Continuous Random Variables (8 hours)	
Competences Expected: 1,6,AG-C07	
Topics	**Learning Outcomes**
• Continuous random variables. • Continuous probability distributions (uniform, exponential, normal). • Expectation and variance.	• Define continuous random variables and their distributions. [Familiarizarse (*Familiarity*)] • Calculate the expectation and variance of continuous random variables. [Usar (*Usage*)] • Apply continuous distributions to model problems. [Evaluar (*Assessment*)]
Readings : [Ros14], [Dev16]	

Unit 4: Joint Probability Distributions (8 hours)	
Competences Expected: 1,6,AG-C07	
Topics	**Learning Outcomes**
• Joint distributions of random variables. • Covariance and correlation. • Independence of random variables.	• Define joint distributions of random variables. [Familiarizarse (*Familiarity*)] • Calculate the covariance and correlation between random variables. [Usar (*Usage*)] • Determine the independence of random variables. [Evaluar (*Assessment*)]
Readings : [Ros14], [Dev16]	

Unit 5: Central Limit Theorem and Law of Large Numbers (6 hours)	
Competences Expected: 1,6,AG-C07	
Topics	**Learning Outcomes**
• Central Limit Theorem. • Law of Large Numbers.	• State and apply the Central Limit Theorem. [Familiarizarse (*Familiarity*)] • Explain the Law of Large Numbers. [Usar (*Usage*)]
Readings : [Ros14], [Dev16]	

Unit 6: Applications in Computing (12 hours)	
Competences Expected: 1,6,AG-C07,AG-C12	
Topics	**Learning Outcomes**
• Analysis of probabilistic algorithms. • Modeling stochastic systems. • Machine learning (e.g., probabilistic models).	• Use probability in algorithm analysis. [Familiarizarse (*Familiarity*)] • Model systems using stochastic processes. [Usar (*Usage*)] • Apply probability calculus in machine learning models. [Evaluar (*Assessment*)]
Readings : [Ros14]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

********* EVALUATION MISSING ********

10. BASIC BIBLIOGRAPHY

[Ros14] Sheldon M. Ross. *A First Course in Probability*. Pearson, 2014.

[Dev16] Jay L. Devore. *Probability and Statistics for Engineering and the Sciences*. Cengage Learning, 2016.