# NATIONAL UNIVERSITY OF SAN MARCOS

FACULTY OF MATHEMATICAL SCIENCES

SYLLABUS

## 1. GENERAL INFORMATION

| | | |
|---|---|---|
| **1.1 Course name** | : | Inferential Statistics |
| **1.2 Code** | : | STA252 |
| **1.3 Academic Program** | : | Scientific Computing |
| **1.4 Credits** | : | 5 |
| **1.5 Prerrequisites** | : | MA351. Statistics and Probabilities. ($6^{th}$ Sem) |
| **1.6 Type of Course** | : | Elective |
| **1.7 Area of Studies** | : | Estudios Generales |
| **1.8 Number of Weeks** | : | 16 |
| **1.9 Hours per week** | : | 3 HT; 4 HP; |
| **1.10 Cycle** | : | I |
| **1.11 Learning modality** | : | Face to face |
| **1.12 Academic Period** | : | 2026-I |
| **1.13 Semester Start Date** | : | |
| **1.14 Semester End Date** | : | |

## 2. PROFESSORS

Meetings after coordination with the professor

## 3. INTRODUCTION TO THE COURSE

Inferential statistics is crucial in computer science for analyzing data, drawing conclusions, and making evidence-based decisions. This course covers the principles of statistical inference, including point estimation, confidence intervals, and hypothesis testing.

## 4. GOALS

- Understand the fundamental concepts of inferential statistics.
- Apply point estimation techniques and confidence intervals.
- Conduct hypothesis tests to make data-driven decisions.

## 5. COMPETENCES

**ABET-1)** An ability to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline. (Familiarity)

## 6. TOPICS

| **Unit 1: Introduction to Statistical Inference (6 hours)** | |
|---|---|
| **Competences Expected: ABET-1** | |
| **Topics** | **Learning Outcomes** |
| • Sampling and sampling distributions.<br>• Point estimation.<br>• Confidence intervals. | • Describe the principles of sampling and sampling distributions. [Familiarizarse]<br>• Calculate point estimates for population parameters. [Usar]<br>• Construct and interpret confidence intervals. [Evaluar] |
| **Readings :** [**Devore2020**], [**Montgomery2019**] | |

| **Unit 2: Hypothesis Testing (10 hours)** | |
|---|---|
| **Competences Expected: ABET-1** | |
| **Topics** | **Learning Outcomes** |
| • Null and alternative hypotheses.<br>• Type I and Type II errors.<br>• P-value.<br>• Hypothesis tests for means and proportions. | • Formulate null and alternative hypotheses. [Familiarizarse]<br>• Calculate and interpret the p-value. [Usar]<br>• Conduct hypothesis tests for means and proportions. [Evaluar] |
| **Readings :** [**Devore2020**], [**Montgomery2019**] | |

| **Unit 3: Analysis of Variance (ANOVA) (8 hours)** | |
|---|---|
| **Competences Expected: ABET-1** | |
| **Topics** | **Learning Outcomes** |
| • One-way ANOVA.<br>• Two-way ANOVA. | • Apply one-way ANOVA to compare means of multiple groups. [Familiarizarse]<br>• Conduct two-way ANOVA to analyze the influence of two variables. [Usar] |
| **Readings :** [**Devore2020**], [**Montgomery2019**] | |

| **Unit 4: Linear Regression (8 hours)** | |
|---|---|
| **Competences Expected: ABET-1** | |
| **Topics** | **Learning Outcomes** |
| • Simple linear regression.<br>• Multiple linear regression. | • Fit a simple linear regression model. [Familiarizarse]<br>• Interpret the coefficients of a linear regression model. [Usar]<br>• Apply multiple linear regression to model the relationship between multiple variables. [Evaluar] |
| **Readings :** [**Devore2020**], [**Montgomery2019**] | |

| Unit 5: Non-parametric Tests (8 hours) | |
|---|---|
| **Competences Expected: ABET-1** | |
| **Topics** | **Learning Outcomes** |
| • Chi-square test.<br>• Mann-Whitney U test.<br>• Kruskal-Wallis test. | • Apply non-parametric tests when the assumptions of parametric tests are not met. [Familiarizarse]<br>• Perform the chi-square test for independence. [Usar]<br>• Use the Mann-Whitney U and Kruskal-Wallis tests to compare groups. [Evaluar] |
| **Readings :** [**Devore2020**] | |

| Unit 6: Applications in Computing (8 hours) | |
|---|---|
| **Competences Expected: ABET-1** | |
| **Topics** | **Learning Outcomes** |
| • Data analysis in computational experiments.<br>• Model validation.<br>• Machine learning (e.g., model evaluation). | • Apply inferential statistics techniques to analyze data in computational experiments. [Familiarizarse]<br>• Use statistical methods to validate computational models. [Usar]<br>• Apply inferential statistics in evaluating machine learning models. [Evaluar] |
| **Readings :** [**Devore2020**] | |

## 7. WORKPLAN

### 7.1 Methodology

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

### 7.2 Theory Sessions

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

### 7.3 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.

## 8. EVALUATION SYSTEM

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

## 9. BASIC BIBLIOGRAPHY