NATIONAL UNIVERSITY OF SAN MARCOS

FACULTY OF MATHEMATICAL SCIENCES

SYLLABUS

1. GENERAL INFORMATION

1.1 Course name	:	Discrete Structures II
1.2 Code	:	CS1D2
1.3 Academic Program	:	Scientific Computing
1.4 Credits	:	3
1.5 Prerrequisites	:	CS1D1. Discrete Structures I. (3^{rd} Sem)
1.6 Type of Course	:	Mandatory
1.7 Area of Studies	:	Estudios Generales
1.8 Number of Weeks	:	16
1.9 Hours per week	:	2 HT; 2 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

Continuing from Discrete Structures I, this course explores more complex mathematical structures such as sets, relations, and functions, which are the basis for data modeling in databases and programming languages. Additionally, students will study counting techniques and recurrence relations, providing the analytical tools required to estimate the computational complexity of algorithms.

4. GOALS

- Perform complex operations on sets, functions, and relations.
- Model database relations and function properties formally.
- Apply counting techniques to analyze search spaces and probability.
- Solve recurrence relations to analyze the efficiency of recursive algorithms.

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. (Usage)

ABET-2) An ability to formulate or design a system, process, procedure, or program for the intended purpose. (Familiarity)

6. TOPICS

Unit 1: Discrete Mathematics (24 hours)	
Competences Expected: ABET-1,ABET-2	
Topics	**Learning Outcomes**
• Sets: operations, cardinality, power sets, Cartesian products • Relations: properties, equivalence relations, partial orders • Functions: injective, surjective, bijective, composition, inverse	• Define basic set operations and relations [Evaluar] • Apply set operations to solve problems [Usar] • Define properties of relations [Evaluar] • Determine if a relation is an equivalence relation [Usar] • Define types of functions [Evaluar] • Compose functions and find inverses [Usar]
Readings : [**Rosen2019**], [**Scheinerman2012**]	

Unit 2: Discrete Mathematics (24 hours)	
Competences Expected: ABET-1,ABET-2	
Topics	**Learning Outcomes**
• Counting: permutations, combinations, binomial theorem • Advanced counting: generating functions, inclusion-exclusion • Recurrence relations: solving simple recurrences • Advanced recurrence: generating functions, asymptotic behavior	• Explain permutations and combinations [Evaluar] • Apply counting techniques to solve problems [Usar] • Define recurrence relations [Evaluar] • Solve simple recurrence relations [Usar] • Develop generating functions for counting problems [Usar] • Apply generating functions to solve complex recurrence relations [Evaluar]
Readings : [**Rosen2019**], [**Grimaldi2003**]	

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