

SAGRADO

Universidad del Sagrado Corazón

SCHOOL OF HEALTH AND SCIENCES

SYLLABUS

TITLE:	Pre-calculus I
CODE:	MAT 133
PREREQUISITE	MAT 101 or 500 or more in the CEEB index
CREDITS:	4 credits 45 contact hours 1 term

DESCRIPTION

The Pre-calculus I course is a theoretical and practical course for the students at the School of Health and Sciences. It emphasizes the concept of function, relation, and graphs. Study of polynomial, rational, exponential, and logarithmic functions. The course studies the properties and transformations of the functions and their applications. Emphasis is placed on problem solving. The purpose of the course is to lay the analytical and geometric foundations necessary for the study of differential and integral calculus.

JUSTIFICATION

Students will acquire the concept of function and develop skills in the interpretation of the different functions so that they can understand the fundamental concepts of calculus, which has applications in the fields of physics, chemistry, and biology.

COMPETENCES

The course develops the following competences in students:

- **Critical questioning**
- **Research and exploration**

OBJECTIVES

After completion of the course, students will be able to:

1. Use the concept of function and its properties to model real situations and solve problems.
2. Plot graphs of basic functions using displacement and translation techniques.

3. Plot, analyze and interpret graphs of polynomial, rational, logarithmic, and exponential functions.
4. Apply the properties of exponential and logarithmic functions in problem solving.
5. Integrate the use of available technology.
6. Understand the importance of mathematics in the study of natural sciences.

CONTENTS

- I. Relation
 - A. Definition
 - B. Graphs
 - C. Domain and range (value field)
 - D. Graphs and equations of a circle
- II. Functions
 - A. Definition
 - B. Domain and range
 - C. Special functions and their graphs
 1. Identity function
 2. Absolute value function
 3. Constant function
 4. Floor and ceiling function
 5. Quadratic function
 6. Piecewise function
 7. Radical function
 - D. Properties
 1. Even, odd, neither even nor odd
 2. Increasing, Decreasing, and Constant
 3. Transformations
 - a. Horizontal and vertical translation
 - b. Expansion and compression
 - c. Reflection
 - E. Algebra and composition of functions
 1. Addition, subtraction, multiplication, and division of functions
 2. Composition of functions

F. Inverse function

1. Definition
2. Determining its existence
3. Finding the inverse and plotting the graph

III. Polynomial and Rational Functions

A. Linear function

1. Definition
2. Intercepts & slope
3. Chart
4. Slope – intercept form
5. Point – slope form
6. Parallel and perpendicular lines

B. Quadratic function

1. Definition
2. Quadratic equation
 - a. Solution
 - 1) By factorization
 - 2) Completing the square
 - 3) Quadratic formula
3. Quadratic function graph
 - a. Vertex coordinates
 - b. Intercept coordinates
 - c. Maximums and minimums
 - d. Word problems
4. Solutions of quadratic inequalities
 - a. Graphs
 - b. Algebraic

C. Polynomial functions of degree greater than two

1. Definition
2. Polynomial zeros
3. Synthetic division
4. Division algorithm
5. Residue theorem

6. Factor theorem
 7. Rational zero theorem
 8. Graphs
- D. Rational functions
1. Definition
 2. Asymptotes
 - a. Verticals
 - b. Horizontal
 - c. Obliques
 3. Graphs
- IV. Transcendental Functions:
- A. Exponential function
1. Domain
 2. Range
 3. Graphs
 4. Word problems
- B. Logarithmic function
1. Domain
 2. Range
 3. Graphs
 4. Properties of common and natural logarithms
- C. Exponential and logarithmic equations

METHODOLOGY

The following strategies from the active learning methodology are recommended:

- Flipped classroom
- Problem discussion
- Collaborative learning
- Teamwork
- Procedure and problem-solving oriented coaching
- Demonstration and practical exercises
- Self-assessment and peer assessment
- Problem based learning
- Use of web resources and tools

EVALUATION

Participation	10%
Compositions	20%
Partial assignments	40%
Final project or exam	30%
Total	100%

LEARNING ASSESSMENT

The institutional assessment rubric is applied to the course's core activity.

BIBLIOGRAPHY

TEXTBOOK

Abramson, J. (2021). *Precalculus*. Openstax.

REFERENCES

Larson, R., Falvo, D.C. (2022). *Precalculus with limits* (5th ed.). Cengage Learning.

Miller, J., Gerken, D. (2017). *Precalculus* (1st ed.). McGraw-Hill Education.

Ruiz Basto, J. (2016). *Matemáticas 4: Precálculo: Funciones y aplicaciones* (2nd ed.).
Grupo Editorial Patria.

Sullivan, M. (2020). *Precalculus* (11th ed.). Prentice Hall.

Swokowski, E. (2019). *Precalculus: Functions & Graphs* (13th ed.). Addison Wesley

ELECTRONIC RESOURCES

GeoGebra for Teaching and Learning Math: <https://www.geogebra.org/>

Let's learn together: <https://www.desmos.com/>

Precalculus: <https://openstax.org/details/books/prec calculus>

Precalculus: <https://www.khanacademy.org/math/prec calculus>

Symbolab: <https://www.symbolab.com/>

Wolframalpha Computational Intelligence: <https://www.wolframalpha.com/>

For more information resources related to the course's topics, access the library's webpage <http://biblioteca.sagrado.edu/>

REASONABLE ACCOMMODATION

For detailed information on the process and required documentation you should visit the corresponding office. To ensure equal conditions, in compliance with the ADA Act (1990) and the Rehabilitation Act (1973), as amended, any student in need of reasonable accommodation or special assistance must complete the process established by the Vice Presidency for Academic Affairs.

ACADEMIC INTEGRITY

This policy applies to all students enrolled at Universidad del Sagrado Corazón to take courses with or without academic credit. A lack of academic integrity is any act or omission that does not demonstrate the honesty, transparency, and responsibility that should characterize all academic activity. Any student who fails to comply with the Honesty, Fraud, and Plagiarism Policy is exposed to the following sanctions: receive a grade of zero in the evaluation and / or repetition of the assignment in the seminar, a grade of F (*) in the seminar, suspension, or expulsion as established in the Academic Integrity Policy effective in November 2022.

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