College of Natural and Computational Sciences

Department of Mathematics

Calculus I Course Syllabus for Physics Students

1. **Course Information**

Course title: Calculus I

Course Code: Math2021

Academic Year: 2022/23

Program: Undergraduate

Target group: 2nd year Physics Students

Enrollment: Regular

Course Category: supportive

Credit hours: 4 hrs.

Year: II **Semester:** I

Instructor's contact information

Instructor's Name: Solomon Amsalu (Asst. Prof.)

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Room No:

2. Course Description

a. Rationale

The main theme of this course is to introduce the fundamental result in power series and technique of integration that are needed for the advanced studies in mathematics.

b. Objectives of the Course

The general objective of this course is to develop learners' understanding of techniques of integration and their applications including some advanced topics. It introduces the concepts of limits of function with the application of intermediate value Theorem. And also, to prepare the students for the advanced studies in mathematics and other Sciences.

c. Learning outcomes

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

- Evaluate limits of functions,
- Determine points of discontinuity of functions,
- Apply Intermediate Value Theorem,
- Evaluate derivatives of different types of functions,
- Apply derivatives to solve problems,
- Evaluate integrals of different types of functions,
- Apply integrals to find areas and volumes.

d. Calculus I: contents and sub contents

This Course is organized in Four Chapter, and this course provides a firm foundation in the basic concepts and techniques of the differential and integral calculus.

3. Instructional method and strategies

a. Teacher's activities

Presentation of lecture followed by guiding the students, demonstrate problem solving, give exercises and monitor the process, give and Solve worksheets during tutorials. Also prepare the online learning resources.

b. Students' activities

Active involvement of learners is required at each phase. This is done through Listen to a lesson, take short notes, asking and answering questions, doing homework, reading assignments, Presentation, Solve exercises, Work in group and individual and etc.

In addition to the above Students should read the relevant sections in the textbook and/or reference materials and do the assignments on time. Practice with solved problems and come to lecture hours to get concepts clarified. Review and extra problems will be given through worksheets. Students are also expected to have worked through the problems in the worksheets before the tutorial sessions. Attendance at lectures and tutorials is expected for all students. Attendance records will be taken at all times. It is the student's chance to ask questions, solve problems and work in team.

4. Assessment Strategies

Mostly, continuous assessment is practiced. However, the essence of continuous assessment is implemented in a way that can address both assessment for learning and assessment of learning. Assessment for learning is practiced at each phase of teaching and learning process to improve student progress to the desired level of interest through guiding, questioning and answering. On the other hand, assessment of learning is also administered framing on the following parameters Note: The continuous assessment method comprises of various modalities as follows;

- Group assignment…….. 10%
- Individual assignment……..... 10%
- Mid exam …….…….... 30%
- Final exam …….…….... 50%

All the aforementioned assessment modalities will conditionally be implemented. However, at least two quiz, two assignment, one mid exam and final exam are mandatory for the completion of the course assessment.

5. Course Outline

1. **Limits and Continuity**
   - 1.1. Definition of limit
   - 1.2. Basic limit theorems
   - 1.3. One-sided limits
   - 1.4. Infinite limits and limits at infinity
   - 1.5. Continuity
   - 1.6. The Intermediate Value Theorem and its applications
2. **Derivatives**
   - 2.1. Definition of derivative

2.2. Tangent and normal lines

2.3. Properties of derivatives

2.4. Derivative of Functions (polynomial, rational, trigonometric, exponential, logarithmic and hyperbolic functions)

2.5. The Chain Rule

2.6. Higher order derivatives

2.7. Implicit differentiation

3. Applications of Derivatives

3.1. Extreme Values of functions

3.2. Rolle's Theorem, the Mean Value Theorem, and their application

3.3. Monotonic functions

3.4. The first and second derivative tests

3.5. Applications to extreme values and related rates

3.6. Concavity and inflection points

3.7. Graphing sketching

3.8. Tangent line approximation and differentials

4. Integrals

4.1. Antiderivatives

4.2. Indefinite integrals and their properties

4.3. Partitions, upper and lower sum, Riemann sums

4.4. Definition and properties of the definite integral

4.5. The Fundamental Theorem of Calculus

4.6. Techniques of integration (integration by parts, integration by substitution, trigonometric integration, integration by partial fractions)

4.7. Application of integration: Area, volume of solid of revolution

6. Text Book & References

Course Textbook

• Robert Ellis, Denny Gulick, Calculus with Analytic, 6th edition Harcourt Brace Jovanovich, publishers.

References

1. Leithold. The Calculus with Analytic Geometry, 3rd Edition, Harper and Row, publishers.

2. Lynne, Garner. Calculus and Analytic Geometry. Dellen Publishing Company.