



Republic of the Philippines
SULTAN KUDARAT STATE UNIVERSITY
Isulan, Sultan Kudarat
College of Industrial Technology
S.Y. 2024-2025



MST 005
DIFFERENTIAL CALCULUS
Syllabus

1st Semester
A.Y 2024 – 2025



Republic of the Philippines
SULTAN KUDARAT STATE UNIVERSITY
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UNIVERSITY VISION

A trailblazer in arts, science and technology in the region.

UNIVERSITY MISSION

The University shall primarily provide advanced instruction and professional training in science and technology, agriculture, fisheries, education and other relevant fields of study.

It shall also undertake research and extension services, and provide progressive leadership in its areas of specialization.

UNIVERSITY GOAL

To produce graduates with excellence and dignity in arts, science and technology.

UNIVERSITY OBJECTIVES

- a. Enhance competency development, commitment, professionalism, unity and true spirit of service for public accountability, transparency and delivery of quality services;
- b. Provide relevant programs and professional trainings that will respond to the development needs of the region;
- c. Strengthen local and international collaborations and partnerships for borderless programs;
- d. Develop a research culture among faculty and students;
- e. Develop and promote environmentally-sound and market-driven knowledge and technologies at par with international standards;
- f. Promote research-based information and technologies for sustainable development;
- g. Enhance resource generation and mobilization to sustain financial viability of the university.

Program objectives and its relationship to University Objectives:

PROGRAM OBJECTIVES (PO)

A graduate of Bachelor of Science in Industrial Technology can:

	a	b	c	d	e	f	g
a) assume professional, technical, managerial and leadership roles in industrial organizations with the desired competence in the fields of practiced such as Automotive, Architectural Drafting, Civil, Electrical, electronics, food and its allied discipline.	✓	✓					
b) innovate explicit and modern technologies in the advancement of economy, society, technology and environmental sustainability.	✓	✓	✓		✓	✓	✓
c) generate research-based information and technologies at par from international standards; and	✓	✓	✓	✓	✓	✓	✓
d) promote and transfer knowledge and technologies for effective and efficient school-industry partnership.	✓	✓	✓		✓	✓	✓

1. Course Code : MST 005
 2. Course Title : Differential Calculus
 3. Pre-requisite : None
 4. Credit : 3 units

5. Course Description:

This course deals with the study of rates of change of quantities. It involves finding derivatives to describe the rate of change of a function and is used to solve problems involving non-constant rates of change. Topics include the review of algebra, trigonometry, exponential and logarithmic functions, coordinates and graphs. Each of these tools is introduced in its cultural and historical context.

6. Course Learning Outcomes and Relationships to program Educational Objectives

Course Learning Outcome				Program Objectives			
				a	b	c	d
At the end of the semester, the students can:							
a) Differentiate algebraic and transcendental functions				✓	✓	✓	✓
b) Apply the concept of differentiation in solving word problems				✓	✓	✓	✓
c) Analyze and trace transcendental curves.				✓	✓	✓	✓

7. Course Content

Topic: VMGO, Classroom Policies, Course Overview, Course Requirements, Grading System (1.5 hour)						
Course Objectives, Topics, Time Allotment	Desired Student Learning Objectives	Outcome-Based Assessment (OBA) Activities	Evidence of Outcomes	Course Outcomes	Program Objectives	Values Integration
Explain VMGO of the SKSU, classroom policies, scope of the course, course requirements and grading system.	Student can be aware of the SKSU VMGO, classroom policies, scope of the course, course requirements and grading system.	<ul style="list-style-type: none"> • Class Discussion • Student's Feedbacking 	<ul style="list-style-type: none"> • Individual Recitation 	a,b	a, b, c, d	Value of Responsibility

Section 1: Limits of Function and Derivatives of a Function

1. Functions 2. Limits 3. Continuity of a Function	1. Perform operations on functions 2. Define different types of functions 3. Define the limit of a function, one sided limit, limit at infinity and infinite limit. 4. Apply the theorems on limits in evaluating the limit of a function. 5. Define continuity of a function 6. Apply the concept of continuity of a function.	1. Class Discussion 2. Video-watching 3. Written Exercises	<ul style="list-style-type: none"> Exercises (Worktext) Selected Problems in the IM Recommended Video: Review: Addition and Subtraction of Algebraic Expressions <u>FUNCTIONS II</u> <u>GRADE 11</u> <u>GENERAL</u> <u>MATHEMATICS</u> <u>Q1</u> (youtube.com) Limit of a Function <u>ILLUSTRATING THE LIMIT OF A FUNCTION II</u> <u>BASIC CALCULUS</u> (youtube.com) Evaluating limits by factoring & conjugate <u>Evaluating Limits by Factoring & Conjugate - Basic/Differential</u> 	a, b	a, b	Value of Attentiveness
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			<ul style="list-style-type: none"> <u>Calculus</u> <u>(youtube.com)</u> • <u>Limits of Infinity</u> <u>Limits at Infinity II</u> <u>Differential</u> <u>Calculus in</u> <u>Filipino</u> <u>(youtube.com)</u> • <u>Continuity of a</u> <u>function</u> <u>CONTINUITY OF</u> <u>FUNCTIONS AT A</u> <u>POINT BASIC</u> <u>CALCULUS</u> <u>(youtube.com)</u> • Continuity <u>Continuity of</u> <u>Functions at a</u> <u>Number</u> <u>(Tagalog/Filipino</u> <u>Math)</u> <u>(youtube.com)</u> • Quiz 		
4. The Derivatives 5. The Four-Step Rule 6. Basic Formulas for Differentiation 7. The Chain Rule	1. Apply the four-step rule in finding the derivatives of a function 2. Find the Derivatives of a Function using the different formulas in differentiation. 3. Apply the chain rule in finding the derivative of x as a function of u or y as a function of u .	1. Class Discussion <u>Derivative of Algebraic Function</u> (BASIC DERIVATIVE OF ALGEBRAIC FUNCTIONS BASIC CALCULUS <u>(youtube.com))</u> 2. Video-watching 3. Written Exercises	<ul style="list-style-type: none"> Exercises (Worktext) Recommended video: https://www patreon.com/ProfessorLeonard Quiz 	a, b	a, b, d

8. Implicit Differentiation 9. Higher-Order Derivatives	1. State and illustrate the rule on implicit differentiation; 2. Find the derivative of functions using implicit differentiation; 3. Find the higher-order derivatives of functions;	1. Class Discussion 2. Video-watching 3. Written Exercises 4. Practice Exercises (https://tutorial.math.lamar.edu/Classes/Calc/implicitDiff.aspx) https://tutorial.math.lamar.edu/Classes/Calc/HigherOrderDerivatives.aspx <ul style="list-style-type: none"> • Exercises (Worktext in Calculus I – Implicit Differentiation & Higher Order Derivatives) • Textbook Calculus with Analytic Geometry • Quiz 			
10. Derivatives of Trigonometric Functions 11. Derivatives of Inverse Trigonometric Functions	1. Understand the concepts of the derivatives of trigonometric and inverse trigonometric functions; 2. Apply the appropriate differentiation formula for any given problem involving derivatives and trigonometric and inverse trigonometric functions; 3. Apply the appropriate formulas in optimization problems involving trigonometric and inverse trigonometric functions; 4. show commitment and active involvement in learning new things	1. Class Discussion Derivative of Trigonometric function (<u>DERIVATIVE OF TRIGONOMETRIC FUNCTIONS</u> <u>BASIC CALCULUS</u> (youtube.com)) 2. Video-watching 3. Written Exercises	a, b	a, b, d	Value of Self-Reliance

12. Derivatives of Logarithmic and Exponential functions 13. Derivatives of Hyperbolic Function	1. Apply the properties of logarithmic and exponential functions in simplifying mathematical expressions 2. Understand hyperbolic functions 3. Apply the formula for the derivatives of logarithmic and exponential functions 4. Apply the formula for the derivatives of hyperbolic functions		<ul style="list-style-type: none"> • Problem Sets • Quiz 	a, b	a, b, d	Value of Understanding
14. Slope of a Curve 15. Critical Numbers, and Increasing and Decreasing Functions 16. Maximum and Minimum Points, and the First Derivative Test 17. Concavity, Points of Inflection, and the Second Derivative Test 18. Curve Sketching	1. Interpret derivative as the slope of the tangent line to a curve. 2. Apply derivative to find the slope of the given curve at a given point. 3. Apply derivative to find the equations of the tangent and normal lines. 4. Apply slope of a curve to determine the angle between two curves. 5. Determine the critical numbers and critical points of a function. 6. Determine the intervals on which a function is increasing or decreasing. 7. Apply the First Derivative Test to find the maximum and minimum points of a curve.	Polynomial Curves <u>(POLYNOMIAL CURVES II EQUATION OF TANGENT LINE TO THE CIRCLE (youtube.com))</u> Tangent and Normal line to a Curve <u>(Tangent and Normal Line to a Curve II Differential Calculus in Filipino (youtube.com))</u>	<ul style="list-style-type: none"> • Problem Sets • Quiz 	a, b	a, b, c, d	Value of Responsibility

	<p>8. Determine the intervals on which a function is concave upward or concave downward.</p> <p>9. Apply the Second Derivative Test to find the maximum and minimum points of a curve.</p> <p>10. Determine the points of inflection of a curve. Sketch a curve.</p>					
19. Optimization Problems 20. Rate of Change	<p>1. Apply derivatives in solving optimization problems.</p> <p>2. apply derivatives in solving rate of change problems.</p>		<ul style="list-style-type: none"> • Exercises (Worktext) • Selected Problems in the IM • Recommended Video: • Review: Quiz 	a, b	a, b	Value of Attentiveness
21. Parametric Equation	<p>1. Find the derivatives of parametric equations.</p> <p>2. Determine the equations of tangents for parametric curves.</p>		<ul style="list-style-type: none"> • Problem Sets • Quiz 	a, b	a, b, d	Value of Responsibility
22. Increment and differentials 23. Partial Derivatives of a Function of Two Variables 24. Total Differential	<p>1. Understand the concept of approximation using differentials</p> <p>2. Estimate the propagated error using differential</p> <p>3. Apply the concept of differential to practical problems.</p>		<ul style="list-style-type: none"> • Problem Sets • Quiz 	a, b	a, b, d	Value of Responsibility

	4. Find the partial derivatives of a function of two variables.					
TOTAL: 54 hours						
Lectures: 51 hours						
Examination (Midterm and Final): 3 hours						

8. Course Evaluation

Course Requirements:

- Attendance
- Major Exams (Midterm and Final)
- Recorded Problem Sets, Quizzes and all other outputs

Grading System:

MIDTERM

- | | |
|--|---------------|
| 1. Quizzes | - 25 % |
| 2. Class Participation/Seatworks/
Assignments | - 15 % |
| 3. Midterm Exam | - 50 % |
| 4. Attendance | - <u>10 %</u> |
| Total | - 100% |

FINAL TERM

- | | |
|--|---------------|
| 1. Quizzes | - 25 % |
| 2. Class Participation/Seatworks/
Assignments | - 15 % |
| 3. Final Exam | - 50 % |
| 4. Attendance | - <u>10 %</u> |
| Total | - 100% |

(Midterm Grade + Final Term Grade)/2= Final Grade

Schedule of Examination

- | | |
|------------|---|
| Midterm | - |
| Final Term | - |

References:

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3. Retrieved from The Math Mystery: Mathematics in Nature and Universe (Youtube Video)
4. Retrieved from [\(FUNCTIONS || GRADE 11 GENERAL MATHEMATICS Q1 \(youtube.com\)\)](#)
5. Retrieved from Limit of a Function [ILLUSTRATING THE LIMIT OF A FUNCTION || BASIC CALCULUS \(youtube.com\)](#)
6. Retrieved from Evaluating limits by factoring & conjugate [Evaluating Limits by Factoring & Conjugate - Basic/Differential Calculus \(youtube.com\)](#)
7. Retrieved from Limits of Infinity [Limits at Infinity || Differential Calculus in Filipino \(youtube.com\)](#)
8. Retrieved from [Continuity of a function CONTINUITY OF FUNCTIONS AT A POINT || BASIC CALCULUS \(youtube.com\)](#)
9. Retrieved from Continuity [Continuity of Functions at a Number \(Tagalog/Filipino Math\) \(youtube.com\)](#)
10. Retrieved from The derivatives <https://www.patreon.com/ProfessorLeonard>
[\(https://tutorial.math.lamar.edu/Classes?Calc/implicitDiff.aspx\)](https://tutorial.math.lamar.edu/Classes?Calc/implicitDiff.aspx)
11. Retrieved from <https://tutorial.math.lamar.edu/Classes/Calcl/HigherOrderDerivatives.aspx>

Prepared by:



MAY FLOR L. TAPOT, MST
Subject Teacher

Reviewed by:



JENA MAE M. FATAGANI, MAT
BSIT Program Head

Approved by:

ABRAHAM S. ACCAD, PhD
Dean