UNIVERSITY OF SOUTHERN MINDANAO

COURSE SYLLABUS for CALCULUS 1

Course Number	MATH 111b	Rev. No.	Ø	Page 1 of 13

EFFECTIVE DATE	REV. NO.	REVISION TYPE	CHANGE DESCRIPTION	PAGE AFFECTED	ORIGINATOR
August 28, 2020	Ø	New	Newly established Calculus 1 syllabus for BS Applied Mathematics program. Flexible mode of instruction is adapted.	ALL	Philip Lester P. Benjamin

Author:	Reviewer:	Verifier:	Validator:	Final Approver:	DCC USE ONLY
PHILIP LESTER P. BENJAMIN, PhD Course Developer Date: 2020. 07. 21	JUPITER G. PILONGO, MS Subject Expert Date: 2020. 07. 23	ROWEL P. MADIO, MST Math & Stat Faculty Date: 2020. 07. 28	JONALD L. PIMENTEL, PhD CSM Dean Date: 2020. 08-04	CONSUELO A. PAGARO, EdD Vice President for Academic Affairs Date: 2020. 08.11	DOCUMENT CONTROL INDICATOR MASTER 2020.09.10 COPY

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INSTITUTIONAL POLICIES	
Vision	Quality and relevant education for its clientele to be globally competitive, culture sensitive and morally responsive human resources for sustainable development.
Mission	Help accelerate socio-economic development[M1], promote harmony among the diverse cultures[M2] and improve quality of life[M3] through instruction, research, extension and resource generation in Southern Philippines.
Core Values	**G**-Goodness, **R**-Responsiveness, **E**-Excellence, **A**-Assertion of Right and **T**-Truth
USM Quality Policy Statement	The University of Southern Mindanao, as a premier university, is committed to provide quality instruction, research development and extension services and resource generation that exceed stakeholders' expectations through the management of continual improvement efforts on the following initiatives. 1. Establish key result areas and performance indicators across all mandated functions; 2. Implement quality educational programs; 3. Guarantee competent educational service providers; 4. Spearhead need-based research outputs for commercialization, publication, patenting, and develop technologies for food security, climate change mitigation and improvement in the quality of life; 5. Facilitate transfer of technologies generated from research to the community for sustainable development; 6. Strengthen relationship with stakeholders; 7. Sustain good governance and culture, sensitivity; and 8. Comply with customer, regulatory and statutory requirements.
Goals of the College	1. The College of Science and Mathematics of the University of Southern Mindanao is committed to the comprehensive preparation of the next generation of scientists and mathematicians in this part of the country. 2. The College supplies a condition in which faculty can advance and support high-quality research programs in which students can collaborate and contribute to new knowledge that improves quality of life. 3. The College aspires to be the center of excellence in Science and Mathematics in order to serve diverse students, preparing them for their future careers in line with the vision and mission of the University. 4. The College serves the community and the industry as an impartial source of quality graduates in Science and Mathematics that provides education, literacy, innovation and solution generation to challenges.
Department Objectives	The Department of Mathematics and Statistics aims to: 1. produce students with mastery in the core areas of mathematics and statistics, including algebra, analysis, and geometry; 2. develop students' skills in pattern recognition, generalization, abstraction, critical analysis, synthesis, problem-solving and rigorous argument; 3. express an enhanced perception of the vitality and importance of mathematics in the modern world including inter-relationships within math and its connection to other disciplines;and 4. develop students' skills in creating and evaluating mathematical conjectures and arguments, and in validating their own mathematical thinking.

PROGRAM INFORMATION					
Degree Program	Bachelor of Science in Applied Mathematics	CHED CMO Reference	48 Series of 2017	BOR Approval	BOR Resolution no. 24 s. 2020

COURSE DETAILS					
Course Title	Calculus 1				
Course Number	MATH 111b		Curriculum Component	(Curriculum Element C)	
Credit (--Unit)	4 Units	LECTURE (Unit-Hours)	4 Units - 4 Hours	LABORATORY (Unit-Hours)	0 Units - 0 Hours
Prerequisites	None	Co-requisites	None	Year Level/Semester Offered	1st Year - First Semester
Course Description	This is a first course in Calculus. It covers limits, continuity, derivatives of algebraic and transcendental functions (exponential, logarithmic, trigonometric, hyperbolic and their inverses), applications of derivatives, differentials; antiderivatives, definite integrals, Fundamental Theorem of Calculus, and applications of definite integrals.				
Faculty in charge					
Consultation Hours			Contact Information		

PROGRAM EDUCATIONAL OBJECTIVES (PEO)		MISSION		
In 3-5 years, the **BSAM** graduates of USM shall:		M1	M2	M3
PEO 1	Provide leadership in various development programs both public and private	✓		
PEO 2	Equip with technical, conceptual and human resource skills	✓		✓
PEO 3	Pursue entrepreneurial activities	✓		✓
PEO 4	Able to adapt to diverse culture		✓	
PEO 5	Pursue advanced studies in emerging related fields		✓	✓

NOTE: The PEO's are based on the professional, industry, local, national and international needs and requirements of the program identified through consultation with constituents and stakeholders.

PROGRAM OUTCOMES (PO) Upon graduation, the University of Southern Mindanao **BSAM** students must be able to:	PEO1	PEO2	PEO3	PEO4	PEO5	PEO6	PEO7	PEO8	PEO9	PEO10	...
a) Articulate and discuss the latest development in the specific field of practice.		✓									
b) Effectively communicate orally and in writing using both English and Filipino		✓			✓						
c) Work effectively and independently in multidisciplinary and multi-cultural teams			✓	✓							
d) Act in recognition of professional, social and ethical responsibility	✓										
e) Preserve and promote "Filipino historical and cultural heritage"				✓							
f) Participate in the generation of new knowledge in research and development projects.		✓									
g.) Demonstrate broad and coherent knowledge and undestanding in the core areas of physical and natural sciences.		✓									
h.) Apply critical and problem solving skills using the scientific method.		✓									
i.) Interpret relevant scientific data and make judgements that include reflection on relevant scientific and ethical issues.	✓	✓			✓						
j.) Carry out basic mathematical and statistical computations and use appropriate technologies in the analysis of data.		✓			✓						
k.) Communicate information, ideas, problems, and solutions, both orally and in writing, to other scientists, decision makers, and the public.	✓	✓	✓	✓							
l.) Relate science and mathematics to the other disciplines.		✓	✓	✓	✓						
m.) Design and perform safe and responsible techniques and procedures in laboratory or field practices.		✓									
n.) Critically evaluate input from others.		✓		✓							
o.) Appreciate the limitations and implications of science in everyday life.		✓									
p.) Commit to the integrity of data.		✓		✓	✓						
q.) Gain mastery in the cores areas of mathematics: algebra, analysis, and geometry.		✓			✓						
r.) Demonstrate skills in pattern recognition, generaliztion, abstraction, critical analysis, synthesis, problem-solving and rigorous argument.		✓									
s.) Develop an enhanced perception of the vitality and importance of mathematics in the modern world including inter-relationships within math and its connection to other disciplines.		✓		✓							
t.) Appreciate the concept and role of proof and reasoning and demonstrate knowledge in reading and writing mathematical proofs.		✓			✓						
u.) Make and evaluate mathematical conjectures and arguments and validate their own mathematical thinking.		✓			✓						
v.) Communicate mathematical ideas orally and in writing using clear and precise language.	✓	✓									

NOTE: Minimum PO's shall come from the PSG/CMO of the program if applicable. Other additional PO's may come from consultations with constituents and stakeholders.

COURSE OUTCOMES (CO)		POa	POb	POc	Pod	POe	POf	POg	POh	POi	POj	POk	POl	POm	POn	POo	POp	POq	POr	POs	POt	POu	POv	POw	POx	POy	POz
Upon passing this course, the students must be able to:		Course Alignment to Program Outcomes																									
CO 1	Evaluate the limit of a function using the limit theorems.	I					I		I				I														
CO 2	Define continuity at a point and on an interval.	I					I		I				I														
CO 3	Distinguish between continuous and discontinuous functions.	I					I		I				I														
CO 4	Use the definition to get the derivative of a function.	I					I		I				I														
CO 5	Apply the differentiation rules on various types of functions.																										
CO 6	Apply the derivative tests to find the maxima/minima of a function, graph functions and solve optimization problems.																										
CO 7																											
CO 8																											

Level (follow the legend used in the most relevant PSG/CMO)

[I] = Introductory. This introduces the student to the Program Outcome (PO).

[E] = Enabling. This enables the student to attain the Program Outcome (PO)

[D] = Demonstrative. This demonstrates the student's attainment of the Program Outcome (PO)

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COURSE LEARNING PLAN

Intended Learning Outcomes (ILO) *By the end of the learning experience[1], students must be able to:*	Aligned to CO:	Time Frame *(Week)*	Course Content *(Topics)*	Teaching & Learning Activities (TLA)		Learning Materials	Assessment Tasks (AT)	Suggested Readings
				Teaching Activities	Learning Activities			
• Explain the vision, mission, UQPS of the University • Explain the goals and objectives of the college. • Explain the Program Educational Objectives, Students Outcomes , and Course Outcomes.		1	**Orientation on Classroom and University Policies as well as Grading System** • **Discussion on PEO, SO and CO**	*Orientation Lecture/Discussion*	*Reading; Assignment*	*Computer; Chalkboard*	*Recitation*	*[1]*
1.1.2 Use functional notation to evaluate a function. 1.1.2 Determine the domain and range of a function. 1.1.3 Draw the graph of a function. 1.1.4 Find the zeros of a function. 1.1.5 Recognize a function from a table of values. 1.1.6 Make new functions from two or more given functions. 1.1.7 Describe the symmetry properties of a function.	CO1	1-2	**Review of Functions** • Set builder or interval notation • Evaluating functions • Domain and range • Vertical line test • Zeroes and y-intercepts • Increasing and decreasing functions • Operations on functions	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]
2.1.1 Describe the tangent problem and how it led to the idea of a derivative. 2.1.2 Explain how the idea of a limit is involved in solving the tangent problem. 2.1.3 Recognize a tangent to a curve at a point as the limit of secant lines. 2.1.4 Identify instantaneous velocity as	CO1	3	**Preview of Calculus** • The tangent problem and the differential calculus • The area problem and integral calculus	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]

the limit of average velocity over a small time interval. 2.1.5 Describe the area problem and how it was solved by the integral. 2.1.6 Explain how the idea of a limit is involved in solving the area problem.								
2.2.1 Using correct notation, describe the limit of a function. 2.2.2 Use a table of values to estimate the limit of a function or to identify when the limit does not exist. 2.2.3 Use a graph to estimate the limit of a function or to identify when the limit does not exist. 2.2.4 Define one-sided limits and provide examples. 2.2.5 Explain the relationship between one-sided and two-sided limits. 2.2.6 Using correct notation, describe an infinite limit. 2.2.7 Define a vertical asymptote.	CO1	4-5	**The Limit Function** • Intuitive definition of limit • Evaluating limits using table and graph • Some theorems on limits • The existence of limit • One-sided limits • Infinite limits • Vertical asymptote	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]
2.3.1 Recognize the basic limit laws. 2.3.2 Use the limit laws to evaluate the limit of a function. 2.3.3 Evaluate the limit of a function by factoring. 2.3.4 Use the limit laws to evaluate the limit of a polynomial or rational function. 2.3.5 Evaluate the limit of a function by factoring or by using conjugates. 2.3.6 Evaluate the limit of a function by using the squeeze theorem.	CO1	6-7	**The Limit Laws** • Evaluating limits with the limit laws • Limits of Polynomials and rational functions • Additional Limit Evaluation Techniques • The squeeze theorem	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]

2.4.1 Explain the three conditions for continuity at a point. 2.4.2 Describe three kinds of discontinuities. 2.4.3 Define continuity on an interval. 2.4.4 State the theorem for limits of composite functions. 2.4.5 Provide an example of the intermediate value theorem.	CO2 CO3	8	**Continuity** • Continuity at a point • Types of Discontinuities • Continuity over an interval • The Intermediate Vale Theorem	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]
3.1.1 Recognize the meaning of the tangent to a curve at a point. 3.1.2 Calculate the slope of a tangent line. 3.1.3 Identify the derivative as the limit of a difference quotient. 3.1.4 Calculate the derivative of a given function at a point. 3.1.7 Estimate the derivative from a table of values.	CO4	9	**Defining the derivative** • The tangent line • The Derivative of a Function at a Point • Derivative from a table of values.	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]
All ILOs covered in Midterm	3		**Week 10: MIDTERM EXAMINATION**					
3.2.1 Define the derivative function of a given function. 3.2.2 Graph a derivative function from the graph of a given function. 3.2.3 State the connection between derivatives and continuity. 3.2.4 Describe three conditions for when a function does not have a derivative.	CO4	11-12	**The Derivative as a Function** • Derivative Functions Graphing a Derivative • Derivatives and Continuity	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]
3.3.1 State the constant, constant multiple, and power rules. 3.3.2 Apply the sum and difference rules to combine derivatives. 3.3.3 Use the product rule for	CO5		**Differentiation Rules** • The Basic Rules • The Power Rule • The Sum, Difference, and Constant Multiple Rules	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook	Quizzes Exams Seatworks Reports/ Reflective paper	[2] [3] [4] [5] [6]

finding the derivative of a product of functions. 3.3.4 Use the quotient rule for finding the derivative of a quotient of functions. 3.3.5 Extend the power rule to functions with negative exponents. 3.3.6 Combine the differentiation rules to find the derivative of a polynomial or rational function.			• The Product Rule • The Quotient Rule • Combining Differentiation Rules			Projector Laptop/PC	USM VLE Exercises	[7] [8]
3.5.1 Find the derivatives of the sine and cosine function. 3.5.2 Find the derivatives of the standard trigonometric functions.	CO5	13 - 15	**Derivatives of Trigonometric Functions** • Derivatives of the Sine and Cosine Functions • Derivatives of Other Trigonometric Functions	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]
3.6.1 State the chain rule for the composition of two functions. 3.6.2 Apply the chain rule together with the power rule. 3.6.3 Apply the chain rule and the product/quotient rules correctly in combination when both are necessary. 3.6.4 Recognize the chain rule for a composition of three or more functions.	CO5		**The Chain Rule** • The Chain and Power Rules Combined • Combining the Chain Rule with Other Rules • Composites of Three or More Functions	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]

3.7.1 Calculate the derivative of an inverse function. 3.7.2 Recognize the derivatives of the standard inverse trigonometric functions.	CO5		**Derivatives of Inverse Functions** • The Derivative of an Inverse Function • Derivatives of Inverse Trigonometric Functions	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]
3.8.1 Find the derivative of a complicated function by using implicit differentiation. 3.8.2 Use implicit differentiation to determine the equation of a tangent line.	CO5		**Implicit Differentiation** • Derivative of a function by using implicit differentiation. • Finding Tangent Lines Implicitly	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]
3.9.1 Find the derivative of exponential functions. 3.9.2 Find the derivative of logarithmic functions. 3.9.3 Use logarithmic differentiation to determine the derivative of a function.	CO5	16-17	**Derivatives of Exponential and Logarithmic Functions** • Derivative of the Exponential Function • Derivative of logarithmic functions. • Logarithmic Differentiation	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]
4.1.1 Express changing quantities in terms of derivatives. 4.1.2 Find relationships among the derivatives in a given problem. 4.1.3 Use the chain rule to find the rate of change of one quantity that depends on the rate of change of other quantities.	CO6		**Applications of Derivatives** **Related rates:** • Setting up Related-Rates Problems **Maxima and Minima** • Absolute Extrema • Local Extrema and Critical	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	Chalkboard/ Whiteboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8]

4.2.1 Define absolute extrema. 4.2.2 Define local extrema. 4.2.3 Explain how to find the critical points of a function over a closed interval. 4.2.4 Describe how to use critical points to locate absolute extrema over a closed interval.			• Points • Locating Absolute Extrema					
All ILOs covered in the Course	**2**	**18**	**FINAL EXAMINATION**					

** any interaction, course, program, or other experience in which learning takes place (http://www.edglossary.org/learning-experience/).*

Textbook/References

[1] USM Student Manual
[2] Anton, H., Bivens, I.C., and Davis, S., Calculus Early Transcendentals, 10th Edition, Wiley, 2011.
[3] Anton, H., Bivens, I.C., and Davis, S., Calculus, 10th Edition, Wiley, 2012.
[4] Edwards, Jr, C.H. and Penney, E., Calculus, Early Transcendentals, 7th Edition, Prentice Hall, 2007.
[5] Etgen, G., S. Salas and E. Hille, Calculus: One and Several Variables, 9th Ed., John Wiley and Sons, Inc., 2003.
[6] Leithold, Louis, The Calculus 7, Harper Collins, 1996.
[7] Stewart, J., Calculus: Early Transcendentals, 7th Edition, Brooks/Cole, 2011.
[8] Thomas, G.B., Wier, M.D. and Hass, J.L., Thomas' Calculus, 12th Edition, Pearson, 2009.

Life-long Learning Opportunity

Research

Course Evaluation

Course Outcomes (CO)	Assessment Task Addressing CO	Weight (%)	Satisfactory Rating	Target Standard
CO 1: Evaluate the limit of a function using the limit theorems.	Quizzes/Summative Exams Major Exam	60 40	60	75% of the class obtained a satisfactory rating
CO 2: Define continuity at a point and on an interval.	Quizzes/Summative Exams Major Exam	60 40	60	75% of the class obtained a satisfactory rating
CO 3: Distinguish between continuous and discontinuous functions.	Quizzes/Summative Exams Major Exam	60 40	60	75% of the class obtained a satisfactory rating
CO 4: Use the definition to get the derivative of a function.	Quizzes/Summative Exams Major Exam	60 40	60	75% of the class obtained a satisfactory rating
CO 5: Apply the differentiation rules on various types of functions.	Quizzes/Summative Exams Major Exam	60 40	60	75% of the class obtained a satisfactory rating
CO 6: Apply the derivative tests to find the maxima/minima of a function, graph functions and solve optimization problems.	Quizzes/Summative Exams Major Exam	60 40	60	75% of the class obtained a satisfactory rating
CO 7:	Quizzes/Summative Exams Major Exam	60 40	60	75% of the class obtained a satisfactory rating
CO 8:	Quizzes/Summative Exams Major Exam	60 40	60	75% of the class obtained a satisfactory rating

Grading System

Midterm Grade
Quizzes/USM VLE Exercises/Summative Exams-----60%
Midterm Exam/USM VLE Exam---------- 40%

Final Grade
50% Midterm Grade+50% Final Term Grade

Final Term Grade
Quizzes/USM VLE Exercises/Summative Exams-----60%
Midterm Exam/USM VLE Exam---------- 40%

Passing Grade
60%

Classroom Policies

1. **Come to class prepared for recitation, class discussions, or unannounced quizzes at all times.** Demonstrate personal responsibility by obtaining notes and finding out any instructions/important announcements given on the class period missed.
2. **Absence is not a right, nor a privilege.** The University Code on absence and tardiness applies. Seven (7) absences gets a final grade of 5.0. Twice late is equivalent to one absence. Absences can be excused only after presenting official documents.
3. **All submissions must be your original work.** Cite sources properly. Plagiarism and any form of academic cheating get a corresponding grade of 5.0 and can be grounds for suspension or expulsion.
4. **Keep all distractions away.** This includes electronic gadgets and homework assignments. Use of cellphones during class without permission of the instructor is prohibited at all times. Presentation notes will be provided.
5. **Take a minute to tidy up.** Make it a habit to leave the classroom better than when you entered. Keep chairs arranged before and after group activities. Observe a clean and orderly room always.