

UNIVERSITY OF SOUTHERN MINDANAO

COURSE SYLLABUS for CALCULUS 2



Course Number

MATH 122b

Rev. No.

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EFFECTIVE DATE	REV. NO.	REVISION TYPE	CNANGE DESCRIPTION	PAGE AFFECTED	ORIGINATOR
February 1, 2021	Ø	New	Newly established compressed syllabus for 25 Applied Mathematics program for use during COVID-19 Pandemic. Flexible mode of instruction is adapted.	ALL	Philip Lester P. Benjamin
			ELECTRONICALLY RELEASED 2025.07.09		

Author:	Reviewer:	Verifier:	Validator:	Final Approver:	DCC US	E ONLY
					DOCUMENT CON	TROL INDICATOR
PHILIP LESTER P. BENJAMIN, PhD Course Developer late: 2020, 12, 18	Engr. ARNEL B. TOLEDO Subject Expert Date: 2020 122/	ROWEL P. MADIO, MST Subject Expert Date: 2021. 01.04	JONALD L. PIMENTEL, PhD CSM Dean Date: 2021.01.06	Vice President for Academic Affairs Date: 2021.01.08	MÁSTÉR 201. 00.16	СОРУ





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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 ^{M2} , promote harmony imping 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 Rights 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 of cross all mandated functions; 2. Implement quality educational programs; 3. Guarantee competent educational service proveers; 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 stake long rs; 7. Sustain good governance and culture as instituity; 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 county. 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 fe. 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.
jectives	The Department of Mathematics and Statistics alms 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 are nhanced perception of the vitality and importance of mathematics in the modern world including inter-relationships within math and its connection to other disciplines; and develop students' skills in creating and evaluating mathematical conjectures and arguments, and in validating their own mathematical thinking.





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Degree Program	Bachelor of Science in Applied Mathematics		CHED CMO Reference	48 Series of 2017	BOR Approval	BOR Resolution no. 24 5. 2020

			COURSE DETAILS								
Course Title Calculus 2											
Course Number	MATH 122b		Curriculum Component	Core Subject							
Credit (Unit)	4 Units	LECTURE (Un' 4) TS)	4 Units - 4 Hours	LABORATORY (Unit-Hours)	o Units - o Hours						
Prerequisites	MATH 111b	Co-requisites	None	Year Level/Semester Offered	1st Year - Second Semester						
Course Description	coordinates, cylindrical	ond of a series of the e calculus cou surfaces, surfaces of revolution, and or rectional derivative relative and absolu-	quadric surfaces; vectors andvector-	valued functions; functions of severa	n parametric equations and polar al variables; partial derivatives and						
Faculty in charge											
Consultation Hours		10	Contact Information								

PROGRAM EDUCATIONAL OBJECTIVES (PEO)			MISSION					
In 3-5 ye	ears, the BSAM graduates of USM shall:	Mı	M ₂	Мз				
PEO 1	Provide leadership in various development programs both public and private							
PEO 2	Equip with technical, conceptual and human resource skills			1				
PEO 3	Pursue entrepreneurial activities		100	+ -				
PEO 4	Able to adapt to diverse culture		1					
PEO 5	Pursue advanced studies in emerging related fields		1	+-				

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.





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PROGRAM OUTCOMES (PO) Upon graduation, the University of Southern Mindanao BSAM students must be able to	PEO1	203	503	, EO4	500	E07	PE08	E09	PE010
The discoss the latest development in the specific field of practice.		V							
The state of the s		1			1				
The state of the s			1	1					
y visual visual of professional, social and ethical responsibility	1								
e) Preserve and promote "Filipino historical and cultural heritage"				1					
f) Participate in the generation of new knowledge in research and development projects.		1							
g.) Demonstrate broad and coherent knowledge and undestanding it. The re areas of physical and natural sciences.		1							
n.) Apply critical and problem solving skills using the scientific method.		1							,
l.) Interpret relevant scientific data and make judgements that it lude reflection on relevant scientific and ethical issues.	1	1			1				
.) Carry out basic mathematical and statistical computations appropriate technologies in the analysis of data.		1			1	· · · · · · · · · · · · · · · · · · ·			lon sun L
k.) Communicate information, ideas, problems, and solutions, both orally and in writing, to other scientists, decision makers, and the public.	1	1	1	1			B 1000		
.) Relate science and mathematics to the other discipline.		1	1	1	1				
m.) Design and perform safe and responsible technique, and procedures in laboratory or field practices.		1		Ų.					
n.) Critically evaluate input from others.	+	1		1					
).) Appreciate the limitations and implications of science in everyday life.	+	1							
c.) Commit to the integrity of data.	+	1		1	1				
.) Gain mastery in the cores areas of mathematics: algebra, analysis, and geometry.	+-	+		-	1				-
) Demonstrate skills in pattern recognition, generaliztion, abstraction, critical analysis, synthesis, problem-solving and rigorous argument.	+	+							
Develop an enhanced perception of the vitality and importance of mathematics in the modern world including inter-relationships within and	-	+*				4			
Develop an enhanced perception of the vitality and importance of mathematics in the modern world including inter-relationships within math an its connection to other disciplines.	7	1		1					
Appreciate the concept and role of proof and reasoning and demonstrate knowledge in reading and writing mathematical proofs.	_	1,	1		1		+		
Make and evaluate mathematical conjectures and arguments and validate their own mathematical thinking.		+,	1		1				+
Communicate mathematical ideas orally and in writing using clear and precise language.	-	1	1		H				

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.





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	COURSE OUTCOMES (CO)	POa	Pob	2 Z	Poe	Pof	Pog	<u>8</u>	<u>ē</u> ;	₹ 8	PO .	Pom	Po	8	0 0 0	<u> </u>	200	ğ	2	Š	POw	POX	9	POz
Upon p	passing this course, the students must be able to: Course Alignmer to Program Outcomes	1					1	1		1 1	1				1	1	1 1							
CO 1	Apply the differentiation rules on various types of functions.	1				1	1	T		11					100	1	1		1					<u> </u>
CO 2	Apply the derivative tests to find the maxima/minima of a function, graph functions and solve optimization problems.	П		1 100		1	ī	1		1	1					1	1 1							
CO 3	Compute the antiderivatives of various functions and definite integrals	T				1	ı	T		11						1	1		T		10			
CO 4	Evaluate derivatives and integrals using basic techniques of integration.	1				1	1	1	T	1		+		T		1	1							
CO 5				1						1	1			П										
CO 6					1				\top						T	+						1		
07									\vdash		+	+					\pm							
108					744				\dashv			+				\dashv	\forall	+	+			+	-	+

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



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

[I] = introductory. This introduces the student to the Programment (PO).

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



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Intended Lagrania			COURSE LE	EARNING PLAN				
Intended Learning Outcomes (ILO) By the end of the learning experience*, students must be able to:	Aligned to CO:	Time Frame (Week)	Course Content (Topics)		arning Activities (LA) Learning Activities	Learning Materials	Assessment Tasks (AT)	Suggested Readings
 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 a. well as Grading Syste 1 Discussion on 250, SO and CO	Orientation Lecture/Discussion	Reading; Assignment	Computer; Chalkboard	Recitation	[1]
Determine a new value of a quantity from the old value and the amount of change. Calculate the average rate of change and explain how it differs from the instantaneous rate of change. Apply rates of change to displacement, velocity, and acceleration of an object moving along a straight line. Predict the future population from the present value and the population growth rate. Use derivatives to calculate parginal cost and revenue in a usiness situation.	CO1		Average rate of Change Average rate of change Instantaneous rate of change Application of rate of change Marginal cost and marginal revenue Derivatives of Trigonometric Sine and cosine functions Standard trigonometric functions Higher order derivatives of sine and cosine	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 Powerpoint presentation	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8] [9] [10]





UNIVERSITY OF SOUTHERN MINDANAO Course Number MATH 122b Course Title Calculus 2 Rev. No. Ø Page 7 of 14 and cosine functions. Find the derivatives of the standard trigonometric functions. Calculate the higher-order derivatives of the sine and cosine State the chain rule for the CO1 The Chain Rule 3-4 Lecture/ Chalkboard/ composition of two functions. Discussion Quizzes [2] Chain for the mposition Video Presentation Board work Apply the chain rule together Whiteboard Exams [3] of functions Zoom video conference Seat work with the power rule. Book Seatworks [4] Module Group Reporting Cham rule with power Apply the chain rule and the PDF Reports/ [5] USM VLE/ rule, roduct/quotient rule product/quotient rules Workbook Reflective paper [6] MyOpenMath Tasks correctly in combination when ci pin rule for Projector **USM VLE Exercises** [7] both are necessary. composition of three or Laptop/PC [8] Recognize the chain rule for a more functions **Powerpoint** [9] composition of three or more en latives of Inverse Functions presentation [10] functions. Derivative of an inverse Describe the proof of the function chain rule. Derivative of standard Calculate the derivative of an inverse trigonometric inverse function. **functions** Recognize the derivatives of the standard inverse trigonometric functions. Use logarithmic differentiation to determine the derivative of a function. Find the derivative of a CO 1 Implicit Differentiation 5 Lecture/ Discussion Chalkboard/ complicated function by using Quizzes [2] **Derivatives of Exponential and** Video Presentation Board work implicit differentiation. Whiteboard Exams [3] Zoom video conference Logarithmic Functions Seat work Use implicit differentiation to Book Seatworks Module [4] Group Reporting determine the equation of a PDF Reports/ [5] USM VLE/ tangent line. Workbook Reflective paper MyOpenMath Tasks [6] Find the derivative of Projector **USM VLE Exercises** [7] exponential functions. Laptop/PC [8]





		UNIVERS	ITY OF SOUTHERN MINDANAO	50		The state of the s
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Find the derivative of logarithmic functions.					Powerpoint presentation		[9] [10]
Express changing quantities in terms of derivatives. Find relationships among derivatives in a given problem. Use the chain rule to find the rate of change of one quantity that depends on the rate of change of other quantities. Describe the linear approximation to a function at a point. Write the linearization of a given function. Draw a graph that illustrates the use of differentials to approximate the change in a quantity. Calculate the relative error and percentage error in using a differential approximation. Define absolute extrema. Define local extrema. Explain how to find the critical points of a function over a closed interval. Describe how to use critical points to locate absolute extrema over a closed interval.	CO2	Applications of Derivatives Related rates Linear Approximations and Differential. Maxima and Mir ima The Mr an value 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 Powerpoint presentation	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8] [9] [10]





UNIVERSITY OF SOUTHERN MINDANAO Course Number MATH 122b Course Title Calculus 2 Page 9 of 14 Rev. No. Describe the significance of the Mean Value Theorem. State three important consequences of the Mean Value Theorem. Explain how the sign of the CO₂ Applications of Derivatives 8-9 Lecture/ Discussion Chalkboard/ Quizzes [2] first derivative affects the Derivatives and Shape Video Presentation Board work Whiteboard Exams [3] shape of a function's graph. Zoom video conference of a Graph Seat work Book [4] Seatworks State the first derivative test Module Group Reporting Limits a . Inn. ity and PDF for critical points. Reports/ [5] USM VLE/ Workbook Asympto Reflective paper [6] Use concavity and inflection MyOpenMath Tasks Aprile optimization points to explain how the sign Projector USM VLE Exercises [7] of the second derivative Laptop/PC [8] affects the shape of a L'Ho, ital's Rule **Powerpoint** [9] function's graph. presentation [10] Explain the concavity test for a function over an open interval. Explain the relationship between a function an its first and second derivatives. State the second derivative test for local extrema. Calculate the limit of a function as x increases or decreases without bound. Recognize a horizontal asymptote on the graph of a function. Estimate the end behavior of a



function.

function as x increases or decreases without bound. Recognize an oblique asymptote on the graph of a



			UNIVE	RSITY OF SOUTHERN	MINDANAO				
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Analyze a function and derivatives to draw its of the several appring fields. Recognize when to applicate the produced by quotients, products, subtractions, apowers, and apply L'Hôprule in each case. Describe the relative grownate of functions. Find the general antideriof a given function. Explain the terms and now used for an indefinite intestate the power rule for integrals. Use anti differentiation to solve simple initial-value problems. Use sigma (summation)	graph. Ization biled Iy Forms and bital's wth 2 vative CO 3 tation egral.	5	IDT ERM EXAM Antiderivatives Terms and notations for indefinite integral Power rule for integrals Anti-differentiation for initial value problems	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 Powerpoint presentation	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6] [7] [8] [9] [10]	
notation to calculate sums powers of integers. Use the sum of rectangular areas to approximate the auunder a curve. Jse Riemann sums to		13-14	 Integration Approximating Areas The definite integral 	Lecture/ Video Presentation Zoom video conference Module	Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks	Chalkboard/ Whiteboard Book PDF Workbook Projector	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2] [3] [4] [5] [6]	





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 State the defindefinite integrale Explain the terdimits of integrale Explain when a integrable. Describe the reduction the deand net area. Use geometry properties of details to evaluate the affunction. 	nition of the al. Ims integrand, ration, and regration. In function is relationship refinite integral and the refinite integrals rem.					Laptop/PC Powerpoint presentation		[8] [9] [10]	
Describe the m Mean Value The Integrals. State the mean Fundamental The Calculus, Part 1, derivatives of Integrals of Calculus, Part 2. Use the Fundamental The Calculus, Part 2. Use the Fundamental Theorem of Calculus the Fundame	ing of the heorem of to evaluate tegrals. ng of the eorem of the eorem of the eorem of the ental plus, Part 2, to integrals.	04 15 111	The fundamental theorem of 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 Powerpoint presentation	Quizzes Exams Seatworks Reports/ Reflective p USM VLE Exe	[2] [3] [4] [5] eaper [6] [7] [8] [9]	





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Codise Numb	er MATH	122b	Course Title	and the second s	Calculus 2	distribution that the second	Rev	. No. Ø	Page 12 of 14
 Apply the basic integration formulas. Explain the significance of the net change theorem. Use the net change theorem to solve applied problems. Apply the integrals of odd and even functions. Use substitution to evaluate indefinite integrals. Use substitution to evaluate definite integrals. Integrate functions involving 	CO 4		• Integration • Integration Formulas • Substitution	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 Powerpoint presentation	Quizzes Exams Seatworks Reports/ Reflective p USM VLE Exe	[2] [3] [4] [5] paper [6]	1
exponential functions. Integrate functions involving logarithmic functions. Integrate functions resulting in inverse trigonometric functions.	104	17 In	Integrals involving Lingonometric and logarithmic functions Integrals resulting in 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 Powerpoint presentation	Quizzes Exams Seatworks Reports/ Reflective USM VLE Ex	[5] paper [6]	

FINAL EXAMINATION * any interaction, course, program, or other experience in which learning takes place (https://www.edglossary.ora/learning-experience/).





Course Nivert	T	UNIVERSIT	Y OF SOUTHERN MINDANAO			
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Textbook/References

[1] USM Student Manual

[2] Anton, H., Bivens, I.C., and Davis, S., Calculus Early Transcendentals, 10th Edition, W. Ley, 1011.

[3]] Anton, H., Bivens, I.C., and Davis, S., Calculus, 10th Edition, Wiley, 2012.

[4] Edwards, Jr., C.H. and Davis, S., Calculus, Early Transcendentals, 7th Edition, Prent edall, 2007.

[5] Etgen, G., S. Salas and E. Hille, Calculus: One an Several Variables, 9th Edition, 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, 2010

[8] Thomas, G.B, Weir, M.D. and Hass, J.L, Thomas' Calculus, 12th Edition, Pear on, 2009.

[9] Thomas, G.B, Weir, M.D. and Hass, J.L, Thomas' Calculus Early Transplantals, 1st Edition, Pearson, 2006.
[10] Varberg, D., Purcell, E.J., and Rigdon, S.E., Calculus, 9th Edition, Pearson, 2006.

Life-long Learning Opportunity

The most common practical use of calculus is when plotting graphs of ortain formula or functions. Among the disciplines that utilize calculus include physics, engineering, economics, statistics, and medicine. It is used to create mathematical models in order to arrive into an order solution.

	Course Evaluation				
Course Outcomes (CO)	Assessment Task Addressing CO	Weight (%)	Satisfactory Rating	Target Standard	
CO a. Apply the differentiation of	Quizzes/Summative Exams	40	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
CO 1: Apply the differentiation rules on various types of functions.	Major Exam	40	60	75% of the class obtained a satisfactory	
	Assignments/Exercises	20		rating	
CO 2: Apply the derivative tests to find the maxima, minima of a	Quizzes/Summative Exams	60			
function, graph functions and solve optimization problems.	Major Exam	40	60	75% of the class obtained a satisfactor	
	Assignments/Exercises	20	1	rating	
O 3: Compute the antiderivatives of various functions and definite	Quizzes/Summative Exams	60			
integrals	Major Exam	40	60	75% of the class obtained a satisfactor	
	Assignments/Exercises	20	1	rating	
O 4: Evaluate derivatives and integrals using basic techniques of	Quizzes/Summative Exams	60			
integration.	Major Exam	40	60	75% of the class obtained a satisfacto	
	Assignments/Exercises	20	1 "	rating	





Course Number	I MATH	UNIVERSI	TY OF SOUTHERN MINDANAO			
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Midterm Grade	Grading System	
Quizzes/Summative Exams40% Midterm Exam/USM VLE Exam 40% Assignments/Exercises20%	Final Grade 50% Midter of de+50% Final Term Grade	
Final Term Grade Quizzes/Summative Exams	Passion Grade 6c%	

Classroom Policies

1. Come to class prepared for recitation, class discussions, or unana punced quizzes at all times. Demonstrate personal responsibility by obtaining notes and finding out any instructions/important announcements given on the class period mased.

2. Absence is not a right, nor a privilege. The University Code of 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 perly. Plagiarism and any form of academic cheating get a corresponding grade of 5.0 and can be grounds for

4. **Keep all distractions away**. This includes electronic gatgets and homework assignments. Use of cellphones during class without permission of the instructor is prohibited at all times. Presentation notes will be provided. In case classes, look for a place conducive to learning.

5. Take a minute to tidy up. Make it a habit to least the classroom better than when you entered. Keep chairs arranged before and after group activities. Observe a clean and orderly room always.

