UNIVERSITY OF SOUTHERN MINDANAO

COURSE SYLLABUS for Advanced Calculus I

Course Number	MATH 312b	Rev. No.	Ø	Page 1 of 9

oEFFECTIVE DATE	REV. NO.	REVISION TYPE	CHANGE DESCRIPTION	PAGE AFFECTED	ORIGINATOR
August 8, 2022	Ø	New	Newly established in accordance to the Quality Management System Requirements	ALL	Debbie Marie B. Verzosa

Author:	Reviewer:	Verifier:	Validator:	Final Approver:	DCC USE ONLY
DEBBIE MARIE B. VERZOSA, PhD Course Developer Date: 2022. 07. 11	PHILIP LESTER BENJAMIN, PhD Subject Expert Date: 2022. 07. 12	LEONARD M. PALETA, PhD Department Head Date: 2022. 07. 13	JONALD L. PIMENTEL, PhD CSM Dean Date: 2022. 07. 14	GEOFFRAY R. ATOK, PhD Vice President for Academic Affairs Date: 2022. 07. 18	DOCUMENT CONTROL INDICATOR MASTER 2022. 07. 19 COPY

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	**Advanced Calculus**				
Course Number	**MATH 312b**		Curriculum Component	**Core Subject**	
Credit (--Unit)	**3 Units**	LECTURE (Unit-Hours)	**3 Units - 3 Hours**	LABORATORY (Unit-Hours)	**0 Units - 0 Hours**
Prerequisites	**MATH 213b**	Co-requisites	**None**	Year Level/Semester Offered	**3rd Year - First Semester**
Course Description	This course discusses application of integration, techniques of integration, sequences and series, and power series.				
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	Explain if a set is countable or uncountable		E						D		E	E			E		E	D	D		D	D	D				
CO 2	Explain if a set is open, closed, neither, or both using interior, accumulation, and boundary points		E						D		E	E			E		E	D	D		D	D	D				
CO 3	Prove theorems related to point set topology		E						D		E	E			E		E	D	D		D	D	D				
CO 4	Explain if a sequence converges to a limit		E						D		E	E			E		E	D	D		D	D	D				
CO 5	Explain if a function converges to a limit		E						D		E	E			E		E	D	D		D	D	D				
CO 6	Prove theorems related to convergence		E						D		E	E			E		E	D	D		D	D	D				

* ***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)

COURSE LEARNING 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)*	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		1	**Orientation on Classroom and University Policies as well as Grading System** • **Discussion on PEO, SO and CO**	*Orientation Lecture/Discussion*	*Reading; Assignment USM VLE*	*Computer; Powerpoint presentation, Laptop/PC*	*Recitation*	*USM Manual*

Course Outcomes.								
• Define denumerable, countable, and uncountable sets in R • Apply the definition to identify whether a set is denumerable, countable, or uncountable	**CO1**	**1-2**	**R as a Complete Ordered Field** • Finite sets in R • Denumerable sets in R • Countable sets in R • Uncountable sets in R	*Lecture/ Video*	*Discussion Seat work Oral Exam/ Reporting USM VLE tasks*	Board Projector Laptop/PC Powerpoint presentation	Quizzes Exams Seatworks Reports/ USM VLE Exercises	Bagby (2020), pp. 1-22 Dutta et al. (2020), pp. 4-5 Ross & Richards (2020), pp. 46-58
• Define interior, accumulation, and boundary points of a set • Apply the definition to identify whether a point in a set is an interior, accumulation, or boundary both	**CO2**	**3-4**	**Point Set Topology** • Interior points • Accumulation points • Boundary points	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Seat work Oral Exam/ Reporting USM VLE tasks*	Board Projector Laptop/PC Powerpoint presentation	Quizzes Exams Seatworks Reports/ USM VLE Exercises	Ross & Richards (2020), pp. 59-69 Dutta et al. (2020), pp. 46-52
• Define open and closed sets • Apply the definition to identify whether a set is open, closed, neither, or both .	**CO2**	**5-6**	**Open and Closed Sets** • Open sets • Closed sets • Sets that are neither open nor closed • Sets that are both open and closed	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Seat work Oral Exam/ Reporting USM VLE tasks*	Board Projector Laptop/PC Powerpoint presentation	Quizzes Exams Seatworks Reports/ USM VLE Exercises	Ross & Richards (2020), pp. 59-69
• State theorems related to point set topology • Prove theorems related to point set topology	**CO3**	**7-8**	**Theorems Related to Point Set Topology** • Bolzano Weierstrass Theorem • Heine-Borel Theorem	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Seat work Oral Exam/ Reporting USM VLE tasks*	Board Projector Laptop/PC Powerpoint presentation	Quizzes Exams Seatworks Reports/ USM VLE Exercises	Ross & Richards (2020), p. 60, 67
MIDTERM EXAM	**3**	**9**	**MIDTERM EXAM**					

• Define increasing, decreasing, and bounded sequences • Apply the definition to identify whether a sequence is increasing, decreasing, bounded.	CO4	10-11	**Sequences** • Increasing sequences • Decreasing sequences • Bounded sequences	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Seat work Group Reporting USM VLE tasks*	*Discussion Seat work Oral Exam/ Reporting USM VLE tasks*	Board Projector Laptop/PC Powerpoint presentation	Bagby (2020), pp. 153-159 Ross & Richards (2020), pp. 71-82
• State the formal definition of the limit of a sequence • Apply the definition to prove that a sequence converges to a limit	CO4	12-13	**Convergence of a Sequence** • Intuitive definition • Formal definition	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Seat work Group Reporting USM VLE tasks*	*Discussion Seat work Oral Exam/ Reporting USM VLE tasks*	Board Projector Laptop/PC Powerpoint presentation	Bagby (2020), pp. 160-163 Dutta et al. (2020), pp. 25-33 Ross & Richards (2020), pp. 75-81
• State the formal definition of the limit of a function as x → a • Apply the definition to prove that a function converges to a limit as x → a	CO5	14-15	**Limit of a Function** • Intuitive definition • Formal definition	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Seat work Group Reporting USM VLE tasks*	*Discussion Seat work Oral Exam/ Reporting USM VLE tasks*	Board Projector Laptop/PC Powerpoint presentation	Bagby (2020), pp. 46-48 Dutta et al. (2020), pp. 61-70 Ross & Richards (2020), pp. 93-100
• Prove theorems related to limits	CO 6	16-17	**Theorems Related to Limits** • Uniqueness • Bounded Monotone Convergence Theorem • Limit of a Sum or Difference	*Lecture/ Video Presentation Zoom video conference Module*	*Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks*	*Discussion Seat work Oral Exam/ Reporting USM VLE tasks*	Board Projector Laptop/PC Powerpoint presentation	Ross & Richards (2020), pp. 101-108 Dutta et al. (2020), pp. 71-88
All ILOs covered in the Course	**6**	**18**	**FINAL EXAMINATION**					

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

Textbook/Reference

[1] USM Student Manual
[2] Bagby, R. (2001). *Introductory analysis: A deeper view of calculus.* San Diego, CA: Harcourt Pre
[3] Dutta, H., Natarajan, P.N., & Cho, Y.J. (2020). *Concise introduction to basic real analysis.* Boca Rat CRC Press/Taylor and Francis.
[4] Ross, J.D., & Richards, K.C. (2020). *Introductory analysis: An inquiry approach.* Boca Raton: C C Press/Taylor and Francis.

Life-long Learning Opportunity

The most common practical use of calculus is when plotting graphs of certain formula or fu ions. 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 optimal solution.

Course Evaluation

Course Outcomes (CO)	Assessment Task Addressing CO	Weight (%)	Satisfactory Rating	Target Standard
CO 1: Explain if a set is countable or uncountable	Assignments/Quizzes/Summative Exams	60	60	75% of the class obtained a satisfactory rating
	Major Exam	40		
CO 2: Explain if a set is open, closed, neither, or both using interior, accumulation, and boundary points	Assignments/Quizzes/Summative Exams	60	60	75% of the class obtained a satisfactory rating
	Major Exam	40		
CO 3: Prove theorems related to point set topology	Assignments/Quizzes/Summative Exams	60	60	75% of the class obtained a satisfactory rating
	Major Exam	40		
CO 4: Explain if a sequence converges to a limit	Assignments/Quizzes/Summative Exams	60	60	75% of the class obtained a satisfactory rating
	Major Exam	40		
CO 5: Explain if a function converges to a limit	Assignments/Quizzes/Summative Exams	60	60	75% of the class obtained a satisfactory rating
	Major Exam	40		
CO 6: Prove theorems related to convergence	Assignments/Quizzes/Summative Exams	60	60	75% of the class obtained a satisfactory rating
	Major Exam	40		

Grading System

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

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

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

Passing Grade
60%

Classroom Policies

1. Come to class prepared for recitation, class discussions, or unannounced quizzes always. 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. 20% of the total class hours means you are DROPPED from the course. 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 (Failed) and can be grounds for suspension or expulsion.
4. During online class, students are expected to:
   a. Show up on a scheduled time and wait to be admitted in the class.
   b. Be always respectful. If your video is on, avoid hand gestures or inappropriate language.
   c. Stay on mute. Click a raise hand button if you have question or something to share.
   d. Stay focused and on task so you don't miss anything the speaker says.
   e. Class participation is highly encouraged.
5. Consultation: You can approach your class mayor for your concerns so he/she will relay them once to your professor
6. All information and queries regarding our class will be posted in our official group chat or facebook group. Refrain from posting unrelated topics in these platforms as these will take up space in the messenger box and will make it difficult to backread important messages.
7. Observe proper decorum when sending messages to your professors.
8. Avoid sending messages online outside office hours or during evening.