Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): MATH 1111 MATHEMATICAL ANALYSIS I (3,3,1)

Course Aims: This course deals with the basic theory of analysis in real-valued functions in single variable. It provides students with a good foundation for more advanced courses in the mathematical science major. Topics include real numbers, sequences and series, limit and continuity, differentiation and indefinite integral.

Prerequisite: Year I standing

Prepared by: Prof Wu Xiaonan

Learning Outcomes (LOs):
Upon successful completion of this course, students should be:

No.	Learning Outcomes (LOs)
	Knowledge
1	Able to understand the completeness of the real line
2	Able to understand the concept and theory of limit
3	Able to understand the concept and theory of continuity
4	Able to understand the concept and theory of uniform continuity
5	Able to understand the concept and theory of differentiation
	Skills
6	Able to establish the rules for differentiation
7	Able to establish the rules for integration
8	Able to apply the basic techniques of rigorous analysis
	Attitudes
9	Able to solve problems independently and collaboratively as part of a team
10	Able to appreciate the power and beauty of mathematics

Assessment:

No.	Assessment Methods	Weighting	Remarks
1	Two 1-hour Tests and Continuous Assessment	30%	Two 1-hour Tests and Continuous Assessment are designed to measure how well the students have learned the basic concepts and fundamental theory of limit, continuity and differentiability.
2	Final Examination	70%	Final Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be analysis and skills based to assess the student's versatility in solving problems in limit, continuity, differentiation and indefinite integral.

Learning Outcomes and Weighting:

Content	LO No.	Teaching (in hours)
I. Real Numbers	1,2,8-10	15
II. Continuity and Differentiation	3,4,5,6,8-10	18
III. Indefinite Integrals	7-10	9

Textbook: P.M. Fitzpatrick, Advanced Calculus, PWS, 1996.

References:

T.M. Apostol, Mathematical Analysis, 5th edition, Addison-Wesley, 1971.
Wilfred Kaplan, Advanced Calculus, Addison-Wesley, 1993.
J.R. Kirkwood, An Introduction to Analysis, PWS-KENT, 2nd edition, 1995.
Jonathan Lewin, An Introduction to Mathematical Analysis, 2nd edition, McGraw Hill, 1993.
William R. Parzynski, Introduction to Mathematical Analysis, International Student Edition, McGraw Hill, 1982.
S. Salas, E. Hille and G.J. Etgen, Calculus, One and Several Variables, 8th edition, John Wiley & Sons, 1999.

Course Content in Outline:

Topic	Hours
I. Real Numbers	15
A. Sets and Numbers	
1. Sets and functions	
2. Completeness axiom	
3. Supremum and infinmum	
4. Archimedean property	
5. Density of rational numbers and the irrational numbers	
B. Limit of sequences of Real Numbers	
1. Cauchy sequence and convergence	
2. Basic properties of limit of sequences	
3. Bolzano-Weierstrass theorem	
II. Continuity and Differentiation	18
A. Continuity	
1. Limit, one-side limit, limit at infinity	
2. Basic properties of continuous functions	
3. Extreme value theorem and intermediate value theorem	
4. Type of discontinuities	
5. Uniform continuity	
B. Differentiation	
1. Algebra of derivatives	
2. Chain rule	
3. Lagrange mean value theorem and Cauchy mean value theorem	
4. L'Hôpital's rule, Taylor's theorem	
5. Maxima, minima	
C. Elementary Functions	
1. Logarithm and exponential functions	
2. Trigonmetric functions and their inverse	
III. Indefinite Integrals	9
A. Antiderivatives	
B. Table of basic integrations	
C. Change of variables and integration by parts	
D. Integration of rational functions	