جامعة آل البيت
دائرة ضمان الجودة والتخطيط

بسم الله الرحمن الرحيم

جامعة آل البيت

College of Science
Department of Mathematics
Course syllabus: Calculus (1)
Second semester 2019/2020

1. Instructor Information:

Instructor Name	Ali Handam
Office Hours	Sunday ,Tuesday, Thursday: 9—10, 10--11
Office Number and Telephone Extension	2202
Email	alihandam@yahoo.com

2. Course Description:

Functions: domain and range, operations on functions, graphs of functions; trigonometric functions; transcendental functions: inverse functions, logarithmic and exponential functions and their derivatives and integrals; limits (the indeterminate forms); hyperbolic functions and their inverses; inverse trigonometric functions, limits: meaning of a limit, computational techniques, limits at infinity, infinite limits; continuity; limits and continuity of trigonometric functions; the derivative: techniques of differentiation, derivatives of trigonometric functions; the chain rule; implicit differentiation; differentials; Roll's Theorem; the mean value theorem; the extended mean value theorem; L'Hopital's rule; increasing and decreasing functions; concavity; maximum and minimum values of a function; graphs of functions including rational functions (asymptotes) and functions with vertical tangents (cusps); antiderivatives; the indefinite integral; the definite integral; the fundamental theorem of calculus ; area under a curve; area between two curves;; some techniques of integration.

3. Course Information:

Course number: 401101	Course Title: Calculus (1)	Level : First year
Course Nature: Theoretical	Prerequisite: None	Lecture time: Sun. Tue. Thu. 11:00 – 12:00
Academic year: 2019 – 2020	Semester: Second	Credit Hours: 3

4. Course Objectives:

Main concepts of calculus are derivatives (rates of change of a function) and integrals (which, in particular, provide a way to recover a function from the knowledge of its derivative). Knowledge and the ability to work with these concepts is essential for further studies of mathematical subjects, as well as for applications of mathematical techniques in other sciences. This course will focus on understanding calculus concepts, analytical reasoning and developing crucial skills in order to calculate, analyze, interpret and communicate the results clearly. Specific course learning objectives are listed below:

1. Learn the general concept of function and its applications to real-world situations.
2. Learn to work with exponential, logarithmic and trigonometric functions and their applications in applied problems.
3. Learn the concepts of the derivative and its underlying concepts such as limits and continuity.
4. Learn to calculate derivative for various type of functions using definition and rules.
5. Apply the concept of derivative to completely analyze graph of a function.
6. Learn about various applications of the derivative in applied problems.
7. Learn about anti-derivative and the Fundamental Theorem of Calculus and its applications.
8. Learn to use concept of integration to evaluate geometric area and solve other applied problems.

5. Intended Student Learning Outcomes:

Successful completion of the course should lead to the following outcomes:

1. **Knowledge and Understanding Skills:** Student is expected to
   - 1.1. Calculate the limit for various types of functions.
   - 1.2. Determine whether a given function is continuous at a certain point.
   - 1.3. Differentiate and integrate various types of functions.

1.4. Sketch the graph of polynomials, trigonometric and rational functions.
1.5. Use correctly some famous Theorems in calculus such as: Intermediate Value Theorem, Mean Value Theorem, and Fundamental Theorem of Calculus.

2. **Intellectual Analytical and Cognitive Skills:** Student is expected to
2.1. Students should be able to use mathematical symbols as well as calculus I concepts (limits, continuity, derivatives, applications of the derivative, antiderivative, the definite and indefinite integral, and the Fundamental Theorem of Calculus) to analyze, graph, and solve real world problems.

3. **Subject- Specific Skills:** Student is expected to
3.1. Calculate limits and determine continuity for functions.
3.2. Perform differentiation and integration correctly.
3.3. Sketch the graph of polynomial and rational polynomial functions, as well as some transcendental functions.

4. **Creativity /Transferable Key Skills/Evaluation:** Student is expected to
4.1. Use mathematical symbols and mathematical structures to model and solve real world problems.
4.2. Choose the correct use of quantifiable measurements of real world situations.

6. Course Content:

Week	Chapter	Subject	Pages and Assignments
1+2	Chapter 0 Before Calculus	0.1 Functions 0.2 New functions from old 0.3 Families of functions 0.4 Inverse functions; Inverse Trigonometric Functions 0.5 Exponential and Logarithmic Functions	1 – 52 all odd questions
3+4+5	Chapter 1 Limits and Continuity	1.1 Limits (An intuitive approach) 1.2 Computing limits 1.3 Limits at infinity; End behavior of a function 1.4 Limits (Discussed More Rigorously) 1.5 Continuity 1.6 Continuity of Trigonometric, Exponential, and Inverse Functions	67 – 121 all odd questions
6+7	Chapter 2 The Derivative	2.1 Tangent lines and rates of change 2.2 The derivative function 2.3 Introduction to techniques of differentiation 2.4 The product and quotient rules 2.5 Derivatives of Trigonometric functions 2.6 The chain rule	131 – 174 all odd questions
7+8	Chapter 3 Topics in Differentiation	3.1 Implicit Differentiation 3.2 Derivatives of logarithmic functions 3.3 Derivatives of Exponential and Inverse Trigonometric functions 3.6 L'Hôpital's Rule: Indeterminate forms	185 – 203 & 219 all odd questions
9+10 +11	Chapter 4 The Derivative in Graphing and Applications	4.1 Analysis of functions I: Increase, Decrease and concavity 4.2 Analysis of functions II: Relative extrema; Graphing polynomials 4.3 Analysis of functions III: Rational functions, Cusps and vertical tangents 4.4 Absolute maxima and minima 4.8 Rolle's theorem, Mean-value theorem	232 – 274 & 302 all odd questions
12+13 +14	Chapter 5 Integration	5.2 The Indefinite integral 5.3 Integration by substitution 5.5 The definite integral 5.6 The Fundamental theorem of Calculus 5.9 Evaluating definite integrals by substitution	390 & 375 – 322 all odd questions
15+16	Chapter 6 Applications of the Definite Integral	6.1 Area between two curves 6.4 Length of a plane curve 6.9 Hyperbolic functions	474 & 413,438 all odd questions

7. Teaching and learning Strategies and Evaluation Methods:

Learning Outcomes	Teaching Strategies	learning Strategies	Evaluation Methods
1) Learn the general concept of function and its applications to real-world situations. 2) Learn the concepts of the derivative and its underlying concepts such as limits and continuity.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give homework assignments	- Classroom presentations - Discussion - First exam
1) Learn the concepts of the derivative and its underlying concepts such as limits and continuity. 2) Learn to calculate derivative for various type of functions using definition and rules.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give homework assignments	- Classroom presentations - Discussion - Second exam
1) Apply the concept of derivative to completely analyze graph of a function. 2) Learn about various applications of the derivative in applied problems.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give homework assignments	
1) Learn about anti-derivative and the Fundamental Theorem of Calculus and its applications. 2) Learn to use concept of integration to evaluate geometric area and solve other applied problems.	- Writing on the blackboard - Ask students questions and discuss them - Solve various issues	Give homework assignments	- Classroom presentations - Discussion - Final exam

8. Assessment:

Assessment	Grade Proportion	Week/Dates
Class Work (Quizzes, Homework and Attendance of the lecture)		
First exam	**25 %**	**7th Week**
Second exam	**25 %**	**12th Week**
Final exam	**50 %**	**End of Semester**
Total	**100 %**	

9. Text Book:

The main reference	Calculus, EARLY TRANSCENDENTALS
Author(s)	HOWARD ANTON, IRL BIVENS and STEPHEN DAVIS
Publisher	JOHN WILEY & SONS, INC.
Year	2012
The edition	10th edition
The reference website	https://arslanhelpyoucom.files.wordpress.com/2016/05/calculus-early-transcendentals-10th-ed-howard-anton-iril-bivens-stephen-davis-ebook.pdf

10. References and additional resources:

1)	James Stewart, Calculus: Early Transcendentals, 7th Edition, Brooks/ Cole 2012. Call number in PU library: 515.15 STE
2)	*Calculus,* EARLY TRANSCENDENTALS, 12th by Thomas
3)	Calculus: Early Transcendentals, 4th Edition, Dennis Zill and Warren S. Wright, Jones and Bartlett Publishers 2011.