Course description:
This course is tended to make strong background of very important ideas in calculus starting with Functions: domain and range, operations on functions, graphs of functions, trigonometric functions, transcendental functions: inverse 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, tangent lines, slope and rates of change.
higher derivative, Roll's Theorem, the mean value theorem, L'Hopital's rule, increasing and decreasing functions, concavity, relative extrema values, absolute extrema values, 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,volum, some techniques of integration.

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.

Aims of the course:
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 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
9. This course will investigate many roles that are very important for students.
10. Also give an idea for real functions and some prosperities of real line R.
11. This course will present and emphasize many topics in mathematics in particular calculus, in order to aid the student in his future mathematical studies.
12. prepare freshmen for higher level courses in mathematics, computer science, Pharmacy and engineering.

Intended Learning Outcomes: (ILOs)

A. Knowledge and Understanding:

A1. Concepts and Theories:

Student is expected to:

Calculate the limit for various types of functions. Determine whether a given function is continuous at a certain point. Differentiate and integrate various types of functions. Sketch the graph of polynomials and rational functions. Use correctly some famous Theorems in calculus such as: Roll's Theorem, Mean Value Theorem, and Fundamental Theorem of Calculus.

A2. Contemporary Trends, Problems and Research:

Student is expected to:

1. Use mathematical symbols and mathematical structures to model and solve real world problems.
2. Choose the correct use of quantifiable measurements of real-world situations.

A3. Professional Responsibility:

prepare freshmen for higher level courses in mathematics, computer science, Pharmacy and engineering.

B. Subject-specific skills:

B1. Problem solving skills:

Calculate limits and determine continuity for functions.

B2. Modeling and Design:

Sketch the graph of polynomial and rational polynomial functions, as well as some transcendental functions.

B3. Application of Methods and Tools:

Perform differentiation and integration correctly.

C. Critical-Thinking Skills:

C1. Analytic skills:

Assess and Classify real functions and its properties using separation axioms and connectedness.

C2. Strategic Thinking:

Capability of thinking in constructing a proof of theorems.

C3. Creative thinking and innovation:

Constructing a proof of theorems and describe different examples.

D. General and Transferable Skills (other skills relevant to employability and personal development):

D1. Communication:

Engage students in solving problems in calculus to build deep thinking and to become active in the communications in the future.

D2. Teamwork and Leadership:

Discussion of how to practically apply the theorems of calculus and skills development Partnership and cooperation to work in a spirit of collective action.

Course structures:

Week	Credit Hours	ILOs	Topics	Teaching Procedure	Assessment methods
1	3	A1,A2 B1,B2	1.1-Functions. 1.2- domain and range. 1.3- Properties of functions. 1.4- Families of functions.	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
2	3	A1,A2 B1,B2 C1,D1	1.5- Trigonometric functions. 1.5- Operations on functions. 1.6- Inverse functions.	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
3	3	A1,A2 B1,B2 D2	2.1- Limits. 2.2- Computing limits. 2.3-Limits at infinity, end behavior of a function.	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
4	3	A1,A2 B1,B2 C2,D2	2.4- Continuity. 2.5- Limits and Continuity of trigonometric functions.	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
5	3	A1,A2 B1,C1 D2	3.1- The derivative function. 3.2- Techniques of differentiation. 3.3- Rules of derivative 3.4-Derivative of trigonometric Functions. 3.5- The chain rule. 3.6-Implicit differentiation.	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
6	3	A1,A2 B1,B2	3.7-Tangent lines, Slope and rates of change. 3.8-Higher derivative.	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
7	3	A1,A2 B1,B2	4.1- Applications of derivative 4.2-Relative extrema values	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
8	3	A1,A2 B1,B2 C1,C2 D1,D2	4.3- Absolute maxima and minima. 4.4- L'hopital's rule (indeterminate forms of type ∞/∞, 0/0).	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
9	3	A1,A2 B1,B2 C1,C2 D1,D2	4-5- Rolle's theorem. 4.6- Mean value theorem.	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
10	3	A1,A2 B1,B2 C1,C2	5.1- The indefinite integral. 5.2- Integration by substitution. 5.3- The definite integral.	Lectures, Cooperative Learning	Exams and HomeWorks

		D1,D2		and Discussion	
11	3	A1,A2 B1,B2 C1,C2 D1,D2	5.4- The first & second fundamental theorem in definite integral of calculus. 5.5- Evaluating definite integrals by substitution.	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
12	3	A1,A2 B1,B2 C1,C2 D1,D2	6.1- Applications of definite integral. 6.2- Area between two curves. 6.2-Volumes by slicing, disk, and washers.	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks
13	3	A1,A2 B1,B2	6.3- Volumes by cylindrical shells.	Lectures, Cooperative Learning and Discussion	Exams and HomeWorks

References:
Main Textbook:
Calculus. H. Anton.…8th edition.
Supplementary Textbook(s):
Any calculus books.

Assessment Methods:

Methods	Grade	Date
1st exam	25 %	10 – 20 / 11 / 2019
2nd exam	25 %	10 – 20 / 12 / 2019
Final exam	50 %	20 – 31 / 01 / 2020