جامعة نيويورك أبوظبي
NYU ABU DHABI

Course Title: Calculus with Applications to Science and Engineering

Course Number: MATH-UH 1012Q

Term: Spring 2020

Number of credits: 4

Prerequisites:
Successful completion of NYU Abu Dhabi placement test

Instructor Information:
Name: Moses Boudourides
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Office number: C1-137

Class time: Tuesday-Thursday 16:05 - 17:20

Location: TBC

Office hours: Monday-Wednesdays 4:00pm - 5:00pm or by appointment

Course Description:
This course presents the foundations of calculus by examining functions and their derivatives and integrals, with an emphasis on proofs and theorems as an introduction to basic mathematical analysis. While the derivative measures the instantaneous rate of change of a function, the definite integral measures the total accumulation of a function over an interval. The relationship between differentiation (finding a derivative) and integration (determining an integral) is described in the Fundamental Theorem of Calculus. In addition to two weekly lectures, students attend a weekly recitation that provides opportunities for rigorous analysis of proofs and theorems associated with the material. This course is primarily intended for students considering Mathematics as a major. Placement into Calculus is decided by discussion with mentors and the results of a mathematics placement examination. With permission of the program in mathematics, Calculus with Applications may substitute for Calculus. Although the topics covered in this Calculus are the same as those covered in Calculus with Applications, Calculus places more emphasis on proofs, while Calculus with Applications places a relatively greater emphasis on examples and applications. Students who complete Calculus will be able to follow simple proofs and recognize different types of proofs, such as proofs by induction and proofs by contradiction.

Course Learning Outcomes (CLOs):
At the end of the course, students will
CLO1: understand and be able to use concepts and tools such as limits, derivatives, integrals, sequences and series;
CLO2: recognize and be able to use the main methods of proof, such as proof by construction, induction and contradiction, in simple cases;
CLO3: understand and be able to prove some of the fundamental theorems involving limits, integrals, derivatives, sequences and series;
CLO4: Demonstrate the ability to properly and correctly apply the theorems, concepts, and tools learned to solve problems.

Teaching and Learning Methods:
Lectures delivered by the instructor and class discussions are the main teaching tools. Students are expected to attend the lectures and weekly discussion sessions, and to consolidate their understanding of the material by solving weekly homework problems.

Course Materials:
Textbook: Calculus: A Complete Course,
Eighth Edition, by Robert A. Adams and Christopher Essex,
Pearson, Toronto, Canada, 2014,
ISBN 978-0-321-78107-9

Assignments:
Homework, quizzes, midterm exam, final exam.

Grading:
The final grade will consist of the following:

Quizzes	20%
Homework	10%
Midterm	30%
Final	40%

Course Schedule (tentative):

WEEK	Section(s) from book	Topics
1	1.2, 1.3	Limits of Functions, Limits at Infinity and Infinite Limits
1	1.4, 1.5	Continuity, The Formal Definition of Limit
2	2.1, 2.2	Tangent Lines and Their Slopes, The Derivative
2	2.3	Differentiation Rules
3	2.4	The Chain Rule
3	2.5, 2.6, 2.7	Derivatives of Trigonometric Functions, Higher-Order Derivatives,
4		Using Differential and Derivatives
4	2.8	The Mean Value Theorem
5	2.9, 2.10	Implicit Differentiation, Antiderivatives and Initial Value Problems
5	3.1, 3.2	Inverse Functions, Exponential and Logarithmic Functions
6	3.3	The Natural Logarithm and Exponential
6	3.5, 3.6	The Inverse Trigonometric Functions, Hyperbolic Functions
7	4.3, 4.4	Indeterminate Forms, Extreme Values
7		**Midterm**
8	4.5, 4.6	Concavity and Inflection, Sketching the Graph of a Function
8	5.1, 5.2	Sums and Sigma Notation, Areas as Limits of Sums
9	5.3	The Definite Integral
9	5.4	Properties of the Definite Integral
10	5.5	The Fundamental Theorem of Calculus
10	5.6, 6.1	The Method of Substitution, Integration by Parts
11	6.5	Improper Integrals
11	9.1	Sequences and Convergence
12	9.2	Infinite Series
12	9.3	Convergence Tests for Positive Series
13	9.4	Absolute and Conditional Convergence
13	9.5	Power Series
14	9.6, 4.10	Taylor and Maclaurin Series, Taylor Polynomials
14	9.7, 9.8	Applications of Taylor and Maclaurin Series, The Binomial Theorem and Binomial Series

Plagiarism:
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