Philadelphia University
Faculty of Science
Department of Basic Sciences and Mathematics
First semester, 2018/2019

Course syllabus

Course title: Calculus (1)	**Course code:** 0250101
Course level: 1st year	**Course prerequisite (s):** ---- **Corequisite (s):** ----
Lecture time:	**Credit hours:** 3

Academic Staff Specifics

Name	Rank	Office number and location	Office hours	E-mail address

Course description (According to the University Catalogue)

This course deals with the following main topics: differentiation of algebraic and transcendental functions, an introduction to analytic geometry, applications of differentiation, and a brief introduction to integration.

Course objectives:

1. Learn the concept of inverse functions and related techniques.
2. Understand the concept of limits and its related topics such as continuity. Then understanding the concept of derivative as a consequence of applying the limit as a tool in solving the problem of finding the instantaneous rate of change. Then learn the techniques of differentiation of functions such as trigonometric, inverse trigonometric, exponential, and logarithmic function.
3. Studying the behavior of the function through exploring its first and second derivatives.
4. Understanding the concept of integration as a tool in solving the problem of finding the area under the curve of a function.

Course

- **Text book**

  Howard Anton, Irl C. Bivens and Stephen Davis, **Calculus: Early Transcendentals, 10th Edition**, JohnWiley & Sons, Inc. 2013.

Teaching methods

Lectures, discussion and problem solving.

Learning outcomes:

- **Knowledge and understanding**
    1. Understand the properties of algebraic and transcendental functions.
    2. Calculate the limit of a function at a point numerically and algebraically using appropriate techniques and including l'Hospital's rule.
    3. Find points of discontinuity for functions.
    4. Interpret the derivative of a function at a point as the slope of the tangent line.
    5. Be able to show whether a function is differentiable at a point.
    6. Compute the expression for the derivative of a function using the rules of differentiation including the power rule, product rule, and quotient rule and chain rule.
    7. Differentiate a relation implicitly and compute the line tangent to its graph at a point.
    8. Differentiate exponential, logarithmic, and trigonometric and inverse trigonometric functions.
    9. Understand the consequences of Rolle's theorem and the Mean Value theorem for differentiable functions.
    10. Learn the Fundamental Theorem of calculus and use it to define the definite integral as the antiderivative.
    11. Integrate various kinds of functions by using the rules of integration and the substitution as a first technique of integration.

- **Cognitive skills (thinking and analysis).**

    1. Derive differentiation formulas.
    2. Derive properties of derivatives and integrals
    3. Gain a basic understanding of the Fundamental Theorem and other theorems of calculus.
    4. Students should be able to use derivatives and integrals to solve problems involving optimization and areas.
    5. Students should understand the connections between limits, derivatives, and integrals and see how these relate to connections between tangents, rates of change, displacements, and areas.
    6. Students should be able to determine appropriate techniques and knowledge necessary to solve mathematical or applied problems involving calculus.
- **Communication skills (personal and academic).**

    1. Discussion of appropriate topics in calculus; solve problems individually, in groups, or as a class quizzes and exams.
    2. Reading and studying the text; daily homework problems from the text; writing assignments on concepts covered in class.
    3. The ability to clearly express an opinion, and accept the opinions of others.
    4. The student should illustrate how to communicating with: Peers, Lecturers and Community.
    5. The student should interpret how to Know the basic mathematical principles using the
    internet.
    6. The student should appraise how to Use the computer skills and library.

7. The student should illustrate how to Search the internet and using software programs to deal with problems.

Assessment instruments

- Exams (First, Second and Final Exams)
- Quizzes.
- Homework assignments

Allocation of Marks	
Assessment Instruments	**Mark**
First examination	**20**
Second examination	**20**
Final examination	**40**
quizzes, homework	**20**
Total	**100**

Documentation and academic honesty

Any form of dishonest conduct will be strictly punished. A student who is caught cheating, or attempting to do so in an exam will be given a zero for the exam and a report will be written to the Dean for further action. A student who helps another student or is seen communicating with another student in an exam will be given the same penalty stated in the previous point. Students with different exam forms are not exempt from the above rules. Repeat offenders will be expelled permanently and banned from future courses.

Course/ academic calendar

week	Basic and support material to be covered
(1)	**Before Calculus:** Functions, New Functions from Old.
(2)	Families of Functions, Inverse Functions.
(3)	Inverse Trigonometric Functions, Exponential and Logarithmic Functions.
(4)	**Limits and Continuity:** Limits (An Intuitive Approach), Computing Limits.
(5)	Limits at Infinity, End Behavior of a Function, Continuity, Continuity of Trigonometric, Exponential, and Inverse Functions.
(6) **First examination**	**The Derivative:** Tangent Lines and Rates of Change, The Derivative Function
(7)	Introduction to Techniques of Differentiation, The Product and Quotient Rules.
(8)	Derivatives of Trigonometric Functions, The Chain Rule.
(9)	**Topics in Differentiation:** Implicit Differentiation, Derivatives of Logarithmic Functions.
(10)	Derivatives of Exponential and Inverse Trigonometric Functions, Related Rates.
(11) **Second examination**	**The Derivative in Graphing and Applications:** Analysis of Functions I: Increase, Decrease, and Concavity, Analysis of Functions II: Relative Extrema; Graphing Polynomials.
(12)	Analysis of Functions III: Rational Functions, Cusps, and Vertical Tangents, Absolute Maxima and Minima.
(13)	Applied Maximum and Minimum Problems, Rolle's Theorem, Mean-Value Theorem.
(14)	**Integration:** An Overview of the Area Problem, The Indefinite Integral.
(15)	Integration by Substitution, The Definition of Area as a Limit; Sigma Notation.
(16) **Final Examination**	The Definite Integral, The Fundamental Theorem of Calculus.

Expected workload:

On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.

Attendance policy:

Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Other Education Resources

Books

- James Stewart, **Calculus: Early Transcendentals, 7th Edition**, Brooks/ Cole 2012.

- Saturnino L. Salas, Garret J. Etgen, Einar Hille, **Calculus: One and Several Variables, 10th Edition**, JohnWiley & Sons, Inc. 2007.