جامعة الزيتونة الأردنية
**Al-Zaytoonah University of Jordan**
كلية العلوم وتكنولوجيا المعلومات
**Faculty of Science and Information Technology**

" عراقة وجودة"
"Tradition and Quality"

| Detailed Course Description - Course Plan Development and Updating Procedures/ **Basic Sciences** Department | **QF01/0408-3.0E** |
|---|---|

| Faculty | Science & Information Technology | Department | Mathematics |
|---|---|---|---|
| Course number | 0120221 | Course title | Calculus 1 |
| Number of credit hours | 3 | Pre-requisite/co-requisite | None |

**Brief Course Description**

This course concerns with the concept of functions, it introduces various types of functions, which exist ( algebraic and transcendental ), The graphs of basic functions in calculus and its domain and range, The relation between some functions like the exponential and logarithmic functions, The concept of the limit of a function , Finding the several kinds of limits at a point and the properties such limits possess, The relation between continuity of a functions and limits; The concept of differentiation for various types of mathematical functions using basic differentiation rules; and finally the concept of optimization problems.

| | **Course goals and learning outcomes** |
|---|---|
| **Goal 1** | Concept of functions (algebraic and transcendental). |
| Learning outcomes | 1.1 Demonstrating all types of functions. 1.2 Knowing the basic properties for algebraic functions. 1.3 Finding Equation of line. 1.4 Classifying Odd and Even functions. |
| **Goal 2** | Graphing of functions and determining their domain and range. |
| Learning outcomes | 2.1 Graphing of polynomials functions and finding its domain and range. 2.2 Graphing of rational functions and finding its domain and range. 2.3 Graph of root functions and finding its domain and range. 2.4 Graphing absolute value functions and finding its domain and range. |
| **Goal 3** | Demonstrating the relation between some functions like the exponential and logarithmic functions. |
| Learning outcomes | 3.1 Graphing the exponential functions and finding its domain and range. 3.2 Graphing the logarithmic functions and finding its domain and range. 3.3 Determining the relation between exponential and logarithmic function. 3.4 Solving inequalities involving exponentials and logarithms. |
| **Goal 4** | Concept of limits of a function. |
| Learning outcomes | 4.1 Recognizing the concept of limits. 4.2 Finding the limit of functions using the Limit Laws. |
| Goal 5 | Demonstrating the concept of limits at infinity |
| Learning outcomes | 5.1 Finding vertical and horizontal asymptotes for a function. 5.2 Finding infinite limits and limits at infinity. |
| Goal 6 | Demonstrating knowledge about the idea of continuity of a function |
| Learning outcomes | 6.1 Understanding the relationship between limits and continuity. 6.2 Using the definition of continuity to determine if a function is continuous. 6.3 Finding the points of discontinuity and removable discontinuity of a function. |
| Goal 7 | Concept of differentiating |
| Learning outcomes | 7.1 Finding the derivative for polynomials. 7.2 Finding the derivative for the root function. |

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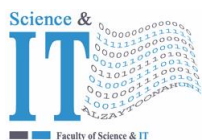|  | 7.3 Finding the derivative for exponentials.<br>7.4 Finding the derivative for logarithms.<br>7.3 Finding the multiplication and division derivative. |
|---|---|
| Goal 8 | Applying derivatives to graph functions and to solve certain optimization problems |
| Learning outcomes | 8.1 Finding critical point of a function.<br>8.2 Finding the increasing and decreasing intervals of a function.<br>8.3 Finding the extreme value of a function.<br>8.4 Finding the concavity intervals and the inflection point of a function. |
| **Textbook** | Calculus and Analytic Geometry, by Howard Anton, John Wiley & sons, 10th Ed., 2012 |
| **Supplementary references** | 1. Calculus, 8th Edition Publisher: Cengage Learning 2016, by James Stewart.<br>2. Calculus, by Salas and Hille, 10th Ed, 2011.<br>3. Calculus Learning by James Stewart, 7th Ed, 2012<br>4.Thomas' Calculus ,14th Ed , 2011 |

| | | | | **Course timeline** |
|---|---|---|---|---|
| **Week** | **Number of hours** | **Course topics** | **Pages (textbook)** | **Notes** |
| **01** | 1<br>1<br>1 | Introduction to Functions, Types of Functions, properties of essential functions, Equation of line. | **1-16** | |
| **02** | 1<br>1<br>1 | Domain and Range of functions, Absolute Value. Functions Sum, Differences, Product, and Quotient of functions. | **17 – 27** | |
| **03** | 1<br>1<br>1 | Composition of functions. Even and Odd Function, Trigonometric Functions. | **28 – 40** | |
| **04** | 1<br>1<br>1 | Logarithmic Equations .Shifting Graphs of functions. Stretching and compression | **40 - 51** | |
| **05** | 1<br>1<br>1 | Informal Definition. Right-Hand and Left-Hand Limits. Two – Sided Limits. Properties. | **84 – 105** | |
| **06** | 1<br>1<br>1 | Limits of Polynomials and Rationals. Limits Involving Infinity.<br>**First Exam:  20%** | **105 – 125** | |
| **07** | 1<br>1<br>1 | The Sandwich Theorem.<br>Limits of Trigonometric Functions<br>Vertical and horizontal asymptotes. | **125 – 137** | |
| **08** | 1<br>1<br>1 | Informal Definition for limits.<br>Continuity of Polynomials and Rationals.<br>Some Properties. | **137 – 146** | |

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| 09 | 1 1 1 | Composites of Continuous Functions. Removable discontinuities. The Intermediate Value Theorem. Slopes and Tangent Lines. | 146 – 171 | |
|---|---|---|---|---|
| 10 | 1 1 1 | Definition of Derivative. Rules of Differentiation. Higher Order Derivatives. | 171 – 206 | |
| 11 | 1 1 1 | Derivatives of Trigonometric. **Second Exam: 20%** | 225 – 245 | |
| 12 | 1 1 1 | The Chain Rule. Implicit Differentiation . Application for Derivatives : Local and Absolute Extrema of functions.. | 225 – 245 | |
| 13 | 1 1 1 | The first Derivative Test for Increasing and decreasing functions Critical Points. | 245 - 276 | |
| 14 | 1 1 1 | The second Derivative Test for concavity. Points of Inflection.  Graph of functions | 276 - 281 | |
| 15 | 1 1 1 | Rolle's Theorm, Mean value Theorem | 281 – 289 | |
| 16 | 1 1 1 | Final exam     ( 50 % ) | | |

| **Theoretical course evaluation methods and weight** | Participation = 10% First exam 20% Second exam 20% Final exam 50% | **Practical (clinical) course evaluation methods** | Semester students' work = 50% (Reports, research, quizzes, etc.) Final exam = 50% |
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| **Approved by head of department** | | **Date of approval** | |
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Extra information (to be updated every semester by corresponding faculty member)

| **Name of teacher** | | Office Number | |
|---|---|---|---|
| Phone number (extension) | | Email | |
| Office hours | | | |