



جمهورية مصر العربية

وزارة التعليم العالي والبحث العلمي

Ministry of Higher Education and Scientific Research



وتكنولوجيا المعلومات

المعهد العالي للحاسبات

مدينة الشروق - القاهرة
شعبة علوم الحاسب

Course specification

Course Code: BS 101

Course Title: Calculus

Academic Year: /

Course specification
(BS 101 Calculus)

Course Outline

Faculty:	<i>HICIT- (Higher Institute for Computers & Information Technology-El Shorouk Academy)</i>		
Programme(s) on which the course is given:	Undergraduate program in Computer Science		
Major or minor element of programme:	Core		
Department offering the program	Department of Computer Science		
Department offering the course:	Department of Computer Science		
Level	1st Year – 1st Semester		
Date of specification approval	DD/MM/2023		

Basic Information

Code:	BS 101	Title:	Calculus
Prerequisites:	-		
Weekly Hours:			
Lecture: 2	Exercise: 2	Practical : -	Total: 3 credit hours

Professional Information

Course Aims:

The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems.

a1	Understand the essential mathematics relevant to computer science.
a4	Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.
b1	Define traditional and non-traditional problems, set goals towards solving them, and observe results.
b7	Establish criteria, and verify solutions.
b8	Identify a range of solutions and critically evaluate and justify proposed design solutions.
c16	Apply tools and techniques for the design and development of applications.
d1	Communicate effectively by oral, written and visual means.
d2	Work effectively as an individual and as a member of a team.
d3	Collaborate effectively within multidisciplinary team.

Program ILOs Covered by Course

Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
A1, A4	B1, B7, B8	C16	D1, D2, D3

Intended learning outcomes of course (ILOs)

a. Knowledge and Under-Standing:

- a1. Understanding the essential concepts related to functions, limits of functions (graphically, numerically and algebraically)
- a2. Explain the essential concepts of continuity and differentiability to algebraic and transcendental functions.
- a3. Understanding derivatives by a variety of techniques including explicit differentiation, implicit differentiation, and logarithmic differentiation. Use these derivatives to study the characteristics of curves. Determine derivatives using implicit differentiation and use to study characteristics of a curve.
- a4. Use basic techniques of integration to find particular or general anti derivatives.

b. Intellectual Skills:

- b1. Construct detailed graphs of nontrivial functions using derivatives and limits.
- b2. Demonstrate the connection between area and the definite integral

c. Professional and practical skills

- c1. Apply the Fundamental theorem of calculus to evaluate definite integrals.

d. General and transferable skills

- d1. Use differentiation and integration to solve real world problems such as rate of change, optimization, and area problems.

Contents

Topic	Contact Hours	
	lecture	Ex/Lab
Functions and Relations	2	2
Limits: limit laws, limits involving infinity	2	2
continuous and discontinuous functions	2	2
Derivative and its meaning, higher order derivatives	2	2
Differentiation Rules: Linearity, Product rule, Quotient rule, Chain rule	2	2
Other examples of derivatives: trigonometric functions, inverse functions, implicit derivatives, logarithmic differentiation	2	2
Applications of differentiation: related rates, max/min problems, derivatives and shapes of curves	2	2
Derivatives of parametric functions	2	2
Leibniz Formula, Rolle's Theorem, Tylor and Maclaurin Series	2	2
Anti-derivatives and initial value problems	2	2

Fundamental Theorem of Calculus, indefinite integration	2	2
Techniques of integration: “u”-substitution , integration by parts	2	2
Integration by using partial fractions	2	2
Other integration topics: integration with CAS, improper integrals, applications of integrations	2	2

Teaching and learning methods	
Teaching and learning methods	Used
Lectures	√
Tutorial Exercises	√
Practical Lab	
Discussions.	√
Self – Learning (Reading material, Websites search,)	
Self-studies	
Group work	
Presentation	
Problem solving/problem solving learning based	
Case study	
Synchronous E-Learning	
Video lectures	
Asynchronous E-Learning	

Student assessment methods & Schedule		
Methods	Used	Week#
Midterm Exam	√	8
Final Exam	√	16
Course Project		
Course Work & Quizzes	√	2-14
Practical Exam		

Assessment Weight	
Assessment	Weight %
Mid Term Exam	20
Practical Exam and Project	
Final Exam	60%
Course Work & Quizzes	20%
Total	100

Course Work & Quizzes	
Short Exams, Assignments, Research, Reports, Presentations	
Class/Project discussion	

List of references

Essential books (textbooks)	Anton, H., Bivens, I. C., & Davis, S. (2020). Calculus (11th ed.). John Wiley & Sons.
Course notes	E-Learning Portal
Recommended books	
Periodicals, website	
Videos link	

Required Facilities

Teaching facilities:	Whiteboard	√
	Computer Lab	√
	Data show	√
	E-Learning	√
	Videos	√
	Website	√

Course Content/ILO Matrix

Course Contents	Knowledge and understanding				Intellectual skills		Professional and practical skills	General
	a1	a2	a3	a4	b1	b2	c1	d1
Functions and Relations	X							
Limits: limit laws, limits involving infinity		X						
continuous and discontinuous functions		X						
Derivative and its meaning, higher order derivatives		X	X					
Differentiation Rules: Linearity, Product rule, Quotient rule, Chain rule		X	X					
Other examples of derivatives: trigonometric functions, inverse functions, implicit derivatives, logarithmic differentiation			X					
Applications of differentiation: related rates, max/min problems, derivatives and shapes of curves								X
Derivatives of parametric functions			X					
Leibniz Formula, Rolle's Theorem, Tylor and Maclaurin Series			X					
Anti-derivatives and initial value problems					X			
Fundamental Theorem of Calculus, indefinite integration				X		X	X	
Techniques of integration: "u"-substitution , integration by parts				X				
Integration by using partial fractions				X				
Other integration topics: integration with CAS, improper integrals, applications of integrations							X	X

Learning Method /ILOs Matrix								
Learning Methods	Knowledge and understanding				Intellectual skills		Professional and practical skills	General
	a1	a2	a3	a4	b1	b2	c1	d1
Lectures	X	X	X	X	X	X	X	X
Tutorial Exercises	X	X	X					
Reading material					X	X	X	
Websites search								
Research and reporting								
Problem solving								
Group work								
Case study								
Practical Lab								
Discussions.								

Assessment Methods /ILOs Matrix								
Assessment Methods	Knowledge and understanding				Intellectual skills		Professional and practical skills	General
	a1	a2	a3	a4	b1	b2	c1	d1
Mid Term Exam	X	X						
Final Exam			X	X	X	X		
Course Work & Quizzes					X	X	X	X

Course ILOs Vs Program ILOs										
Course ILOs \ Prog ILOs		Knowledge and understanding		Intellectual skills			Professional and practical skills	General		
		A1	A4	B1	B7	B8	C16	D1	D2	D3
Knowledge and understanding	a1	√								
	a2		√							
	a3		√							
	a4		√							
Intellectual skills	b1			√	√					
	b2				√	√				
Professional and practical skills	c1						√			
General skills	d1							√	√	√

Course Coordinator: ()

Head of Department: ()

Date: --/--/2023