University/Academy: Arab Academy for Science and Technology & Maritime Transport
Faculty/Institute: College of Computing and Information Technology
Program: Computer Science / Information Systems / Software Engineering

Form No. (12)
Course Specification

1- Course Data

Course Code:	Course Title:	Academic Year/Level:
BA101	Calculus 1	Year 1 / Semester 1
Specialization:	**No. of Instructional Units:**	**Lecture:**
Basic Science	2 hrs lecture 2 hrs section	

2- Course Aim	This course provides basic rules of differentiation, trigonometric function and their derivatives, inverse of trigonometric and their derivatives, logarithmic function and their derivatives, exponential function and their derivatives, derivatives of hyperbolic functions and their inverse, parametric differentiation and implicit differentiation. Application of differentiation: the nth derivatives, l'Hopital rule, partial Differentiation, Taylor and Maclaurin's expansions, complex numbers and conic sections.
3- Intended Learning Outcome:	
a- Knowledge and Understanding	**Students will be able to demonstrate knowledge of:** K12. Understand the essential mathematics relevant to computer science. K14. Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics. (Equivalent to K12 in the IS dept & K13 in the SE dept) • Define differentiation in its physical meaning. (K12, K14) • Define differentiation in its geometrical meaning. (K12, K14) • Recognize the properties of differentiation and its basic rules. (K12, K14) • Define the trigonometric functions. (K12, K14) • Drawing the trigonometric function in the xy-plan. (K12, K14) • Recognize some properties between the trigonometric functions. (K12, K14) • Define the inverse of a function and consequently the inverse of trigonometric functions. (K12, K14) • Define the logarithmic function. (K12, K14) • Define the natural number e. (K12, K14) • Recognize how to differentiate logarithmic function. (K12, K14) • Define the exponential function as the inverse function of the logarithmic function. (K12, K14) • Recognize how to differentiate exponential function. (K12, K14)

	• Define the hyperbolic functions and its relation with exponential function. (K12, K14) • Define the inverse hyperbolic function and its relation with logarithmic function. (K12, K14) • Recognize how to differentiate hyperbolic functions and its inverse. (K12, K14) • Define another form of a function, the parametric form. (K12, K14) • Define the implicit form of a function. (K12, K14) • Explain the possibility of getting the implicit form from the parametric one. (K12, K14) • Explain how to get the nth derivative for a given function. (K12, K14) • Define the limit of a function. (K12, K14) • Recognize the undetermined quantities. (K12, K14) • Explain L'Hospital rule. (K12, K14) • Define a function in more than one variable. (K12, K14) • Recognize how to differentiate a function in more than one variable to a specific one. (K12, K14) • Define a continuously differentiable function. (K12, K14) • Explain how to expand a function in a power series of its variable in a neighborhood of a point by Taylor's expansion. (K12, K14) • Define Maclaurin's expansion as a special case of Taylor's expansion. (K12, K14) • Define velocity and acceleration as differentiation of some physical quantities. (K12, K14) • Define the tangent and the normal lines to a curve at a given point. (K12, K14) • Define a local maximum and local minimum points and reflection points. (K12, K14) • Define the increasing and decreasing intervals, the concavity of a curve(K12, K14) • Explain how to sketch a curve. (K12, K14) • Define the conic sections. (K12, K14) • Recognize the parabola, hyperbola, and the ellipse. (K12, K14)
b- Intellectual Skills	**By the end of the course, the student acquires high skills and an ability to understand:** I2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline. • Apply differentiation to some functions. • Classify even and odd functions. • Simplify forms of trigonometric functions. • Apply differentiation to trigonometric functions. • Transform from one domain to another and vice versa. • Apply differentiation to inverse trigonometric functions. • Apply an operator to an equation. • Simplify forms by using the properties of logarithmic function. • Apply differentiation to logarithmic functions. • Apply differentiation to exponential functions. • Construct a function from another one, a functional. • Apply differentiation to hyperbolic and inverse hyperbolic functions. • Classify many types for a function. • Applying the induction procedures to get a general form for the nth derivative. • Calculate the limit of a function.

	• Know the undetermined quantities. • Appling L'Hospital rule. • Know how to differentiate a function in more than one variable to a specific one. • Getting an approximation of a function at a given point. • Calculate the nth derivative of a function at a given point. • Know the applications of the differentiation. • Imagine the shape of a curve. • Discuss and sketch the conic sections.

c- Professional Skills	**By the end of the course the student will have the ability to:** P8. Handle a mass of diverse data, assess risk and draw conclusions. • Use calculus to compute, graph, model, and solve problems. • Solve applications from different fields involving various meanings of the derivative. • Apply tools and techniques for the design and development of applications. • Set up max/min problems and use differentiation to solve them.
d- General Skills	**Students will be able to:** G1.Demonstrate the ability to make use of a range of learning resources and to manage one's own learning. G3. Show the use of information-retrieval. G5. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension. • Enhance the use numeracy, calculation and statistical methods. • Develop Creativity, imagination skills, and analytic ability.
4- Course Content	1 Differentiate certain types of functions (trigonometric functions and their inverse, exponential function, and logarithmic function). 2 Understand and use the applications of differentiation (l'Hopital, Taylor and Maclaurin's expansions).
5- Teaching and Learning Methods	Lectures, sections, Individual study & self-learning.
6- Teaching and Learning Methods for Students with Special Needs	• Students with special needs are requested to contact the college representative for special needs (currently Dr Hoda Mamdouh in room C504) • Consulting with lecturer during office hours. • Consulting with teaching assistant during office hours. • Private Sessions for redelivering the lecture contents. • For handicapped accessibility, please refer to program specification.
7- Student Assessment:	
a- Procedures used:	Exams and assignments

b- Schedule:	Week 7 exam Week 12 exam assignments Week 16Final exam
c- Weighing of Assessment:	7^{th} week exam 30% 12^{th} week exam 20% assignments 10% Final exam 40%

8- List of References:	
a- Course Notes	From the Moodle on www.aast.edu
b- Required Books (Textbooks)	Sherman K.Stein, Anthony Barcellos, *Calculus & Analytic Geometry*, 2002 5^{th} edition, McGraw-Hill Higher Education, 2002.
c- Recommended Books	
d- Periodicals, Web Sites, ..., etc.	

Course Instructor: **Head of Department: Dr Samah Senbel**

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