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:
BA003	Math0	Year 1 / Semester 1
Specialization: Basic Sciences	**No. of Instructional Units:** 4 hrs lectures 4 hrs sections	**Lecture:**

2- Course Aim	This course provides knowledge about algebra concepts, solid geometry, calculus, statistics, and dynamics. Algebra concepts include permutations complex numbers, and determinants. Solid geometry includes lines and planes, and orthogonal projections. Calculus concepts are limits and continuity, differentiation, behavior, of functions and sketching its graphs, and integration. Statistics concepts include scalar and vector product, the force, equilibrium of a system of coplanar forces. Dynamics include the velocity, the straight motion with uniform acceleration, vertical motion under gravity, differentiation of vector functions, Newton's law of motion, impulse and collision, and work-power-energy.
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) • Understanding Limits (K12, K14) • Explaining differentiation from first principles(K12, K14) • Understanding conjugate (K12, K14) • Explain continuity of a function at a point(K12, K14) • Explain the basic rules of differentiation(K12, K14) • Define the chain rule(K12, K14) • Describe implicit differentiation and higher derivatives(K12, K14) • Explain the derivative of trigonometric functions(K12, K14) • Discuss geometric applications(K12, K14) • Discuss the increasing and decreasing functions(K12, K14) • Explain local maximum and minimum(K12, K14) • Describe the absolute maximum and minimum(K12, K14) • Explain the basic rules of integration(K12, K14) • Define the integrals of simple trigonometric functions(K12, K14) • Discuss some applications of integration(K12, K14)

	• Explain the factorial(K12, K14) • Define combinations(K12, K14) • Define Permutations(K12, K14) • Explain the binomial theorem(K12, K14) • Define Determinants(K12, K14) • Explain the properties of determinants (K12, K14) • Explain the solution of systems of linear equations by Cramer's Rule(K12, K14) • Define complex numbers (K12, K14) • Explain the modulus, amplitude, and the trigonometric form of complex numbers(K12, K14) • Explain De Moivre's theorem(K12, K14) • Explain the exponential form of complex numbers(K12, K14) • Define the cubic roots of unity(K12, K14) • Defining scalars(K12, K14) • Defining Vectors(K12, K14) • Describing the representation of vectors in the plane(K12, K14) • Defining the components of a vector(K12, K14) • Defining unit vectors(K12, K14) • Define Direction(K12, K14) • Define magnitude(K12, K14) • Define point of action(K12, K14) • Explain unit force (Absolute units and partial units) (K12, K14) • Explain the resolution of a force in two perpendicular directions(K12, K14) • Explain the resultant of a set of forces(K12, K14) • Describing equilibrium of coplanar forces meeting at a point(K12, K14) • Explain motion in a straight line(K12, K14) • Explain the straight motion with uniform acceleration(K12, K14) • Explain vertical motion under gravity(K12, K14) • Define Newton's laws of motion(K12, K14) • Explain motion on inclines planes(K12, K14) • Define Work, power and energy(K12, K14) • Define Kinetic energy(K12, K14) Define Potential Energy(K12, K14)
b- Intellectual Skills	**<u>By the end of the course, the student acquires high skills and an ability to understand:</u>** I2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline. • Demonstrate Limits • Apply on differentiation as first principles • Demonstrate conjugate • Demonstrate continuity of a function at a point • Apply on the basic rules of differentiation • Apply on the chain rule • Demonstrate implicit differentiation and higher derivatives • Demonstrate the derivative of trigonometric functions • Demonstrate geometric applications

	• Demonstrate the increasing and decreasing functions • Demonstrate local maximum and minimum • Demonstrate the absolute maximum and minimum • Apply on the basic rules of integration • Demonstrate the integrals of simple trigonometric functions • Analyze some applications of integration • Demonstrate the factorial • Evaluate combinations • Evaluate on Permutations • Demonstrate the binomial theorem • Demonstrate Determinants • Demonstrate the properties of determinants • Demonstrate the solution of systems of linear equations by Cramer's Rule • Demonstrate complex numbers • Demonstrate the modulus, amplitude, and the trigonometric form of complex numbers • Demonstrate De Moivre's theorem • Demonstrate the exponential form of complex numbers • Demonstrate the cubic roots of unity • Demonstrate scalars • Demonstrate Vectors • Demonstrate the representation of vectors in the plane • Identify the components of a vector • Demonstrate unit vectors • Demonstrate Direction • Demonstrate magnitude • Demonstrate point of action • Demonstrate unit force (Absolute units and partial units) • Identify the resolution of a force in two perpendicular directions • Identify the resultant of a set of forces • Demonstrate equilibrium of coplanar forces meeting at a point • Demonstrate motion in a straight line • Demonstrate the straight motion with uniform acceleration • Demonstrate vertical motion under gravity • Demonstrate Newton's laws of motion • Demonstrate motion on inclines planes • Demonstrate Work, power and energy • Demonstrate Kinetic energy • Demonstrate Potential Energy

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.
- Apply tools and techniques for the design and development of applications.
- Solve applications from different fields involving various meanings of the derivative.
- Use integration and partial fractions in many applications in applied sciences.

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

#	CLO
1	Understand permutations, combinations and binomial theorem.
2	Understand real numbers and complex numbers.
3	Identify differential calculus and its applications.
4	Understand lines and planes, and orthogonal projections.
5	Explain the relationship between the derivative and the definite integral as it is expressed in both parts of the Fundamental Theorem of Calculus.
6	Use derivatives and integrals to model and solve applied problems
7	Sketch graphs based on calculus concepts.
8	Generate statistics knowledge by understanding the vectors, the forces, the moments, and couples
9	Differentiate between types of velocity and motion with their applications

5- Teaching and Learning Methods

Lectures, Tutorials, 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 Individual Projects
b- Schedule:	Week 7 exam Week 12 exam Course work Week 16Final exam
c- Weighing of Assessment:	7^{th} week exam 30% 12^{th} week exam 20% Lab work 10% Final exam 40% (However a student must pass the final exam held in a government university to pass the course)
8- List of References:	
a- Course Notes	From the Moodle on www.aast.edu
b- Required Books (Textbooks)	Marvin Bittinger, Judith Beecher, David Ellenbogen, and Judith Penna, Precalculus Graphs and Models, 5th Edition, Pearson, 2012. George Thomas, Maurice Weir, and Joel Hass, Thomas' Calculus Early Transcendentals, 12th Edition, 2010.
c- Recommended Books	James Stewart, *Calculus*, 7^{th} Edition, Brooks Cole, 2011.
d- Periodicals, Web Sites, ..., etc.	

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

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