



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

Form No. (12)
Course Specification

1- Course Data

Course Code: CS301	Course Title: Numerical Methods	Academic Year/Level: Year 3/ Semester 5
Specialization:	No. of Instructional Units: 2 hrs lecture 2 hrs section	Lecture:

2- Course Aim	This course provides an introduction to numerical methods and their applications to solve science and engineering problems. In addition, convergence and error analysis of numerical methods is covered. In addition, practical experience with implementing numerical methods and assessing resulting errors will be acquired through a number of programming assignments.
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3- Intended Learning Outcome:

a- Knowledge and Understanding	Students will be able to demonstrate knowledge of: K14 Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics. K15 Interpret and analyzing data qualitatively and/or quantitatively. <ul style="list-style-type: none">• Understand what's Numerical Analysis and solution of equations (K14, K15)• Demonstrate how to do numerical interpolation of unequal spaced data points, error, and derived difference table. (K14, K15)• Explain how to do numerical interpolation of equally spaced data points, error, and difference tables. (K14, K15)• Describe numerical integration of unequally spaced data points and errors. (K14, K15)• Demonstrate numerical integration of equally spaced data points and error. (K14, K15)• Explain the Rules for Numerical Integration and composite methods (K14, K15)• Explain differentiation rules for unequally spaced data points and error(K14, K15)• Demonstrate differentiation rules for equally spaced data points and error. (K14, K15)• Explain what is meant by least square error and error propagation• Solving linear equations (K14, K15)
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	<ul style="list-style-type: none"> • Demonstrate how to find roots of any equation using the bisection Method (K14, K15) • Demonstrate how to find roots of any equation using the Newton's Raphson method (K14, K15)
b- Intellectual Skills	<p><u>By the end of the course, the student acquires high skills and an ability to understand:</u></p> <p>I13. Identify attributes, components, relationships, patterns, main ideas, and errors.</p> <p>I14. Summarize the proposed solutions and their results.</p> <ul style="list-style-type: none"> • Know the different interpolation techniques and when to use them (I13) • Know the different integration techniques and when to use them (I13) • Comprehend rules and apply them (I14) • Know the different differentiation rules and when to use them(I13) • Demonstrate how to solve equations (I14) • Know the different methods to find roots and when to use them (I13)
c- Professional Skills	<p><u>By the end of the course the student will have the ability to:</u></p> <p>P15. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem.</p> <p>P16. Apply the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video.</p> <ul style="list-style-type: none"> • Show an introduction to Numerical Analysis and solution of equations (P16) • Solve problems of numerical interpolation (P16) • Solve problems of integration using different techniques (P16) • Solve problems using composite methods (P16) • Solve differentiation problems using the different techniques. (P16) • Learn how to measure error & error propogation (P15) • Solve problems on least square error and regression (P15) • Solve problems using the Jaccobi and Gauss-Zeidel methods for Integral Matrices (P16) • Solve numerical problems (P16)
d- General Skills	<p><u>Students will be able to:</u></p> <p>G1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.</p> <p>G3. Show the use of information-retrieval.</p> <p>G5. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.</p>

4- Course Content	<ul style="list-style-type: none"> • Understand numerical methods and errors of computers • Analyze errors and error propagation • Compute roots of equations of one variable • Solve a system of Linear equations • Apply numerical differentiation • Apply numerical integration, • Apply interpolation • Apply regression. • Understand numerical methods and errors of computers • Analyze errors and error propagation
5- Teaching and Learning Methods	Lectures, coursework, assignments, Individual study & self-learning.
6- Teaching and Learning Methods for Students with Special Needs	<ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • For handicapped accessibility, please refer to program specification.
7- Student Assessment:	
a- Procedures used:	Exams, class activities
b- Schedule :	Week 7 exam Week 12 exam Week 16Final exam
c- Weighing of Assessment:	7 th week exam 30% 12 th week exam 20% Section work 10% Final exam 40%
8- List of References:	
a- Course Notes	From the Moodle on www.aast.edu
b- Required Books (Textbooks)	Steven C. Chapra and Raymond P. Canale, Numerical Methods for Engineers with Software and Programming Applications, 5th Edition, McGraw Hill, 2006.
c- Recommended Books	

d- Periodicals, Web Sites, ..., etc.	
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Course Instructor:

Head of Department:

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