



University/Academy: Arab Academy for Science, Technology & Maritime Transport
Faculty/Institute: College of Engineering & Technology
Program: B.Sc. Computer Engineering

Form no. (12): Course Specification

1- Course Data

Course Code: CC413	Course Title: Numerical Analysis	Academic Year/Level: 4th year / 7th semester
Specialization: Computer Engineering	No. of Instructional Units 3	Lecture 2
		Practical 2

2- Course Aim

- Solving Equations, error analysis, solving system of linear algebraic equations, numerical differentiation & integration, Interpolation and regression.

3- Intended Learning Outcomes

a- Knowledge and Understanding	<p>Through knowledge and understanding, students will be able to:</p> <ul style="list-style-type: none"> • List all the main topics to be covered during the course with a brief description to each topic • Demonstrate how to use the bisection and secant method for solution of equations • Explain how to use the modified secant method for solution of equations • Describe how to use the successive approximation method for solution of equations • Demonstrate how to use the modified successive approximation method for solution of equations • Explain how to use the Newton Raphson method and Berge Vieta method for solution of equations • Describe what is meant by errors, sources of error and types of errors • Explain what is meant by Rounding-off, instability and ill conditioning • Demonstrate what are process graphs • Explain what is meant by error propagation • Demonstrate how to use the Gauss Elimination method to solve systems of linear equations • Demonstrate how to use the Gauss Jordan and Gauss Jordan for Integral Matrices • Explain how to use the indirect methods • Demonstrate what is meant by numerical integration • Explain what is numerical interpolation • Explain what is least square error and regression
b- Intellectual Skills	<p>Through intellectual skills, students will be able to:</p> <ul style="list-style-type: none"> • Show an introduction to Numerical Analysis and solution of equations • Solve problems using the bisection and secant method • Solve problems using the modified secant method • Solve problems using the successive approximation method • Solve problems using the modified successive approximation method • Solve problems using the Newton Raphson method and Berge Vieta method • Solve problems using the different types of rounding • Solve problems using process graphs • Solve problems using the Gauss Elimination method • Solve problems using the Gauss Jordan and Gauss Jordan for Integral Matrices • Solve problems using the indirect methods : Jacobbi and Gauss Seidel

	<ul style="list-style-type: none"> • Solve numerical integration problems • Solve problems on numerical interpolation • Solve problems on least square error and regression
c- Professional Skills	<p>Through professional and practical skills, students will be able to:</p> <ul style="list-style-type: none"> • Compare the different types of errors and their sources • Analyzing the errors resulting from different types of rounding methods • Analyzing of errors obtained using process graphs • Compare the results obtained using direct integration and numerical integration
d- General Skills	<p>Through general and transferable skills, students will be able to:</p> <ul style="list-style-type: none"> • none

4- Course Content

Week No.1	Introduction to Numerical Analysis and course description
Week No.2	Solution of equation: Bisection, secant
Week No.3	Solution of equation: Modified Secant (Regula Falsi)
Week No.4	Solution of equation: Successive Approximation
Week No.5	Solution of equation: modified Successive Approximation
Week No.6	Solution of equation: Newton Raphson & Berge Vieta
Week No.7	7th Week Exam
Week No.8	Error Analysis: Rounding off, Instability, Ill conditioning
Week No.9	Error Analysis: Process Graph
Week No.10	Error Analysis Error propagation. Solution of systems of linear equations: Gauss elimination
Week No.11	Solution of a system of linear equations: Gauss Jordan, Gauss Jordan for Integral Matrices
Week No.12	12th Week Exam.
Week No.13	Numerical Integration: Trapezoidal, Simpson and Midpoint rule
Week No.14	Numerical interpolation: Linear, Quadratic, Gaussian
Week No.15	Least square error and Regression: linear, Quadratic
Week No.16	Presentation of projects and Final Exam.

5- Teaching and Learning Methods

<ul style="list-style-type: none"> • Lectures • Tutorials • Reports & sheets • Laboratories • Seminars

6-Teaching and Learning Methods for Students with Special Needs

<ul style="list-style-type: none"> • Lectures • Tutorials • Reports & sheets • Laboratories • Seminars <p>The academic advisors of each student, as well as dedicated department TAs monitor the students' progress and solve any problem he/she may encounter.</p>
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7- Student Assessment

a-Procedures used	1-Written Examinations to assess The Intended Learning Outcomes. 2-Class Activities (Reports, Discussions, -----) to assess The Intellectual Skills.	
b- Schedule:	Assessment 1 Assessment 2 Assessment 3 Assessment 4	7 th Week Written Exam 12 th Week Written Exam Continuous 16 th Week Final Written Exam
c- Weighing of Assessment	7 th Week Examination 12 th Week Examination Final-term Examination Oral Examination Practical Examination Semester Work Total	30 % 20 % 40 % 00 % 00 % 10 % 100%

8- List of References:

a- Course Notes	
b- Required Books (Textbooks)	<ul style="list-style-type: none"> • Steven C. Chapra and Raymond P. Canale, "Numerical Methods for Engineering ", 4^{ED}. McGraw hill,2002
c- Recommended Books	<ul style="list-style-type: none"> • Earl. E. Swarzlender, "Computer Arithmetic-vol1", IEEE, 1990. • Faire Burden, "Numerical Analysis", 5^{ED}. Pws, 1993.
d- Periodicals, Web Sites, etc.	

Course Instructor:
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Program Manager:
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Executive Manager of Quality Assurance Center of AASTMT

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Signature:

Signature: