Course Specifications

General Information

Course name	Numerical Analysis
Course number	MATH3310
Faculty	
Department	
Course type	Major Needs
Course level	3
Credit hours (theoretical)	3
Credit hours (practical)	0
Course Prerequisites	

Course Objectives

1 - Numerical Solution of Mathematical Problems
2 - Introducing computer algorithms for mathematical problems
3 - Convergence and error analysis of the numerical methods

Intended Learning Outcomes

Knowledge and Understanding	* Difference between numerical and analytical solutions
	* Definition of the mathematical problem
	* When we use numerical methods
	* Main concepts of numerical methods
	* flowcharts and computer algorithms
	* Results analysis
	* Develope Cababilities in using mathematical softwares
	* approxamating solutions of unsolved problems
Intellectual Skills	* Modification of Numerical methods in some cases to get closer solution with less error
Professional Skills	* Writing MATLAB usersubroutine to solve mathematical problems
General Skill	* Develop cababilities in Programming

Course Contents

1 - Numerical Methods for Mathematical Problems
2 - Solving Non-Linear Equations
3 - Solving Sets of Equations and Matrix Computations,
4 - Interpolation and Curve Fitting,
5 - Numerical Differentiation and Numerical Integration
6 - Implementation of the computer algorithms into the mathematical package matlab.

Teaching and Learning Methods

1 - Lectures
2 - Discussions
3 - Homeworks
4 - assignments
5 - Computer implementations
6 - Projects

Students Assessment

Assessment Method	TIME	MARKS
First Hour Exam	60 min.	20
Second Hour Exam	60 min.	20
Quizzez	15 min.	5
Project	two weeks	5
Final Exam	120 min	50

Books and References

Course note	Class lectures Notes
Essential books	Applied Numerical Analysis, Gerald, Sixth Edition, "Text"
Other References (Periodical, web sites, ... etc.)	Numerical Analysis, Richard Burden
	Numerical Analysis, Lee, Johnson

Knowledge and Skills Matrix

Main Course Contents	Study Week	Knowledge and Understanding	Intellectual Skills	Professional Skills	General Skill
Introduction, Numerical Computing and Computers	one	main type of calculation errors	techniques to minimize errors	computer units and propagation of error	error analysis in numerical computatio ns
Solving Non-Linear Equations	Two & three	Definition of the mathematical problem	numerical algorithms for solving the problem and error analysis	using computer softwares to solve the problem	another approaches for finding the solution of non linear equation
Matrix Computations	Four	main concepts of matrix operations	matrix operations	matrix operations and definitions of special matrices	matrix operations and definitions of special matrices
Solving Sets of Linear Equations	Five & Six	Numerical methods of solving linear sets of equations	convergence and error analysis of the different methods	building user-subroutines	definition of mathematic al problem and introducing computer algorithms.
Solving Sets of Linear Equations	Seven	studying nonlinear set of equations and numerical methods	putting solutions to guarantee convergence	introducing computer algorithms and subroutines	studying numerical methods for solving system of non-linear equations
Interpolation and Curve Fitting	Eight & Nine & Ten	Studying the main aims of curve fitting and its applications in industry	techniques for interpolation with less error	Introducing professional computer algorithms	problem analysis, numerical methods and computer packages
Numerical Differentiation	Eleven & Twelve	Numerical methods for finding the derivatives of functions	Techniques of differentiation of complicated functions	introducing computer algorithms	analytical and numerical differentiatio ns. using computer softwares

Numerical Integration	Thirteen & Fourteen	Numerical methods and Integration problems	Studying modification of methods to minimize error	Introducing computer algorithms and built-in computer packages functions	mathematical integration problems and numerical methods with convergence
Projects	Fifteen	studying mathematical problems and numerical solutions	modification of methods and analysis	writing scientific reports and using computer packages	Numerical problem solving, introduction to scientific research, writing scientific reports.
Exams	sixteen	Numerical solution of mathematical problems	Numerical solution of mathematical problems	Numerical solution of mathematical problems	Numerical solution of mathematical problems