



Course Specifications

Course Title:	Numerical Analysis 1
Course Code:	MTH 251
Program:	BS-Mathematics
Department:	Mathematics
College:	College of Sciences, AlZulfi
Institution:	Majmaah University, Saudi Arabia

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A. Course Identification

1. Credit hours: 4(3+1)
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: 4 th Semester /2 nd year
4. Pre-requisites for this course (if any): MTH 241 + MTH 221
5. Co-requisites for this course (if any):

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	75%
2	Blended	0	0%
3	E-learning	0	0%
4	Distance learning	0	0%
5	Other	15	25%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	45
2	Laboratory/Studio	0
3	Tutorial	0
4	Others (specify)	15
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description : Numerical methods for solving nonlinear equations (bisection – iteration – Newton - false position ...)- errors and rates of convergence- Direct methods for solving linear systems (Gauss elimination,LU decomposition) and iterative methods (Jacobi – Gauss Seidel – Relaxation)-errors- iteration matrices and convergence of iterative methods- Polynomials interpolation (Lagrange-Newton's methods: divided differences- forward and backward differences) and analysis of errors- Numerical differentiation and integration- errors and accuracy- Gaussian integration formulas- Euler and Taylor methods for solving differential equations of first order.

2. Course Main Objective

- Having the knowledge of the ways to solve some problems in numerical ways using computers.
- Having the knowledge of how to find the derivatives and integrations using numerical methods
- Having the knowledge of how to solve matrix with large dimensions
- Having the ability of interpolation to functions and how to find a function if we know only some points
- Using numerical methods to solve integrations which have no known solutions
- Solving some problems - making some research in Libraries and using internet

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Introduction of Numerical Analysis and Importance What is Linear and Nonlinear Equation? How to solve?	K1
1.2	Methods Direct and Indirect methods? Error, Type of error?	K1
1.3	Numerical Integration/ Differentiation How to find the area under the curve? How to solve the derivative?	K4
1...		
2	Skills :	
2.1	Error Analysis Solve the linear and nonlinear systems direct and indirect approach and comparison	S1
2.2	Algorithms: Established the algorithms and solve	S1
2.3	Use of Software: basic understanding to deal the problem by using computer.	S2
2...		
3	Values:	
3.1	Ability to solve the problem manually as well as using computer	C2
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Numerical methods for solving nonlinear equations (bisection – iteration – Newton - false position ...)- errors and rates of convergence-	12

2	Direct methods for solving linear systems (Gauss elimination,LU decomposition) and iterative methods (Jacobi –Gauss Seidel – Relaxation)- errors- iteration matrices and convergence of iterative methods-	12
3	Polynomials interpolation (Lagrange-Newton's methods: divided differences- forward and backward differences) and analysis of errors	12
4	Numerical differentiation and integration- errors and accuracy- Gaussian integration formulas-	12
5	Euler and Taylor methods for solving differential equations of first order	12
...		
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Introduction of Numerical Analysis and Importance What is Linear and Nonlinear Equation? How to solve?	<ul style="list-style-type: none"> • Lectures/Presentations • Media Lectures • Tutorials 	<ul style="list-style-type: none"> • Exam • Assignment • Quiz • Final Exam
1.2	Methods Direct and Indirect methods? Error, Type of error?	<ul style="list-style-type: none"> • Lectures/Presentations • Media Lectures • Tutorials 	<ul style="list-style-type: none"> • Exam • Assignment • Quiz • Final Exam
...	Numerical Integration/ Differentiation How to find the area under the curve? How to solve the derivative?	<ul style="list-style-type: none"> • Lectures/Presentations • Media Lectures • Tutorials 	<ul style="list-style-type: none"> • Exam • Assignment • Quiz • Final Exam
2.0	Skills		
2.1	Error Analysis Solve the linear and nonlinear systems direct and indirect approach and comparison	<ul style="list-style-type: none"> • Lectures/Presentations • Media Lectures • Tutorials 	<ul style="list-style-type: none"> • Exam • Assignment • Quiz • Final Exam
2.2	Algorithms: Established the algorithms and solve	<ul style="list-style-type: none"> • Lectures/Presentations • Media Lectures • Tutorials 	<ul style="list-style-type: none"> • Exam • Assignment • Quiz • Final Exam
2.3	Use of Software: basic understanding to deal the problem by using computer.	<ul style="list-style-type: none"> • Lectures/Presentations • Media Lectures • Tutorials 	<ul style="list-style-type: none"> • Exam • Assignment • Quiz • Final Exam
3.0	Values		
3.1	Ability to solve the problem manually as well as using computer	<ul style="list-style-type: none"> • Group discussion 	<ul style="list-style-type: none"> • Exercise Electronic MCQ Test
3.2			
...			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1	4 th Week	2.5%
2	Assignment/Home Work 1	5 th Week	2.5%
3	Mid Term 1	7 th Week	20%
4	Quiz 2	9 th Week	2.5%
5	Assignment /Home Work 2	10 th Week	2.5%
6	Class Activities/Discussions	10 th Week	5%
7	Mid Term 2	12 th Week	20%
8	Electronic Test	13 th Week	5%
9	Final Exam	---	40%
	Total		100%

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Department of mathematics has “**Student Academic Advisory Committee**”. This committee is responsible for students counseling and advising works in synchronization and collaboration with the Deanship of Admissions and Registration and Student Affairs. Department of mathematics Alzulfi has a continuous and standardized procedure that be associated with the student's progress until completion of degree and includes psychological, social and behavioral guidance. This advisory committee also maintain the student's files. The students with GPA below than 50 % in Mid 1 and Mid 2 are stayed under serious observation and continuous consultations with respective course instructor about their performing. The course teacher will commit to a minimum scheduled time for student consultation equivalent to **2 HOURS PER WEEK**

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1) R.L. Burden and J.D. Faires: Numerical Analysis. 9th Edition Brooks / cole , 2011.
Essential References Materials	1) Endre Süli, David F. Mayers : An Introduction to Numerical Analysis, Cambridge, 2003. 2) Rizwan Butt, Introduction to Numerical Analysis Using MATLAB, David Pallai, 2008
Electronic Materials	MIT Open Courses

Other Learning Materials	1) https://www.wolfram.com/mathematica/ 2) https://www.mathworks.com/discovery/numerical-analysis.html?s_tid=srchtitle
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2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> - The size of the room should be proportional to the number of students - Provide enough seats for students. - The number of students not exceed on 30 in the classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> - Mathematics Lab is equipped with a computer. - Provide overhead projectors and related items i.e smart Board, Wi-Fi, AV. - Updated Math Software i. e Mathematica, Matlab, Maple.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students/ internal committee	Direct (Students evaluation electronically organized by Deanship of registration and admission)/ Verification of students' papers
Extent of achievement of course learning outcomes	Staff members (Peer Reviewer)	Indirect (Frequent meetings consultation among the teaching staffs)
Quality of learning resources.	Staff members (course coordinators)	Direct (Meeting between course coordinators and the tutors)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Mathematics Department
Reference No.	27
Date	8/8/1442 H -21/3/2021 G

Head of Department

Dr. Muqrin Almuqrin



(Handwritten signature of Dr. Muqrin Almuqrin)

Head of Department

Dr. Muqrin Almuqrin

