هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	Numerical Methods
Course Code:	MH 423
Program:	Computer Science
Department:	Basic Sciences and Humanities
College:	CCIS
Institution:	Majmaah University

Table of Contents

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☑ Department ☐ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 11
4. Pre-requisites for this course (if any)**: Differential Equations-MH223**
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**	44	100
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	33
2	**Laboratory/Studio**	
3	**Tutorial**	11
4	**Others** (specify)	
	Total	44

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides students with techniques in Computational Methods (methods of numerical computations). It helps students understand the concepts of numerical methods and their importance in solving practical problems.

2. Course Main Objective

1. Apply standard techniques to analyze key properties of numerical algorithms such as stability, convergence, ill-conditioning, and Instability
2. Perform data analysis efficiently and accurately using data fitting methods
3. Analyze and use numerical methods for differential equations
4. Perform optimization using well-established methods

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	

CLOs		Aligned PLOs
1.1		
1.2		
1.3		
1...		
2	**Skills :**	
2.1	CLO1. Apply standard techniques to analyze key properties of numerical algorithms such as stability, convergence, ill-conditioning, and Instability	S5
2.2	CLO2. Perform data analysis efficiently and accurately using data fitting methods	S5
2.3	CLO3. Analyze and use numerical methods for differential equations	S5
2.4	CLO4. Perform optimization using well-established methods	S5
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	The standard algorithms for numerical computation: Simple Fixed-Point Iteration, The Bisection Method,	4
2	Newton-Raphson method, False-Position Method, Secant Method	4
3	Newton's Divided-Difference Interpolating Polynomials	4
4	Lagrange Interpolating Polynomials	4
5	Newtons forward, and backward interpolation	4
6	Numerical Integrations, Trapezoidal, Simpsons methods	4
7	Differential Equations: Euler's Method Improvements of Euler's Method	4
8	Runge-Kutta Methods, Solving differential equations of order two	4
9	Solution of Systems of Equations, Shooting Method	4
10	Numerical optimization: One-dimensional Unconstrained Optimization, Golden-section search	4
11	Random Search, Newton's, Parabolic interpolation	4
Total		44

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			
1.2			
…			
2.0	**Skills**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	CLO1. Apply standard techniques to analyze key properties of numerical algorithms such as stability, convergence, ill-conditioning, and Instability	Classroom Teaching	Quiz, Assignments, Mid Exam, Final Exam
2.2	CLO2. Perform data analysis efficiently and accurately using data fitting methods	Classroom Teaching	Quiz, Assignments, Mid Exam, Final Exam
2.3	CLO3. Analyze and use numerical methods for differential equations	Classroom Teaching	Quiz, Assignments, Mid Exam, Final Exam
2.4	CLO4. Perform optimization using well-established methods	Classroom Teaching	Quiz, Assignments, Mid Exam, Final Exam
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1, Quiz2	4,9	15%
2	Midterm Exam	6	20%
3	Home Assignments	2,9	20%
4	Class participation	All weeks	5%
5	Final Examination	12	40%

***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 :

- Each student is allotted to an academic advisor for guidance and counseling.
- Available for a minimum of 2 hours per week/course, as communicated to the students.
- The student also contacts through social networking websites / Blackboard/ Email for advice and consultations.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Steven C. Chapra & P. Canale, Numerical Methods for Scientists and Engineers: McGraw-Hill Science Engineering, 3/e, 2011
Essential References Materials	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2011, 10th edition
Electronic Materials	

Other Learning Materials	Black Board, Class Notes

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart Board, Projector
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Internet Connection

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quiz/Mid Term/ Final Exam assessment	Instructor	Direct
Course Feedback	Students	Survey-Indirect
Final Exam Answer Scripts Verification	Peer faculty members	Review

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	CS Council
Reference No.	45-1444/2
Date	2022