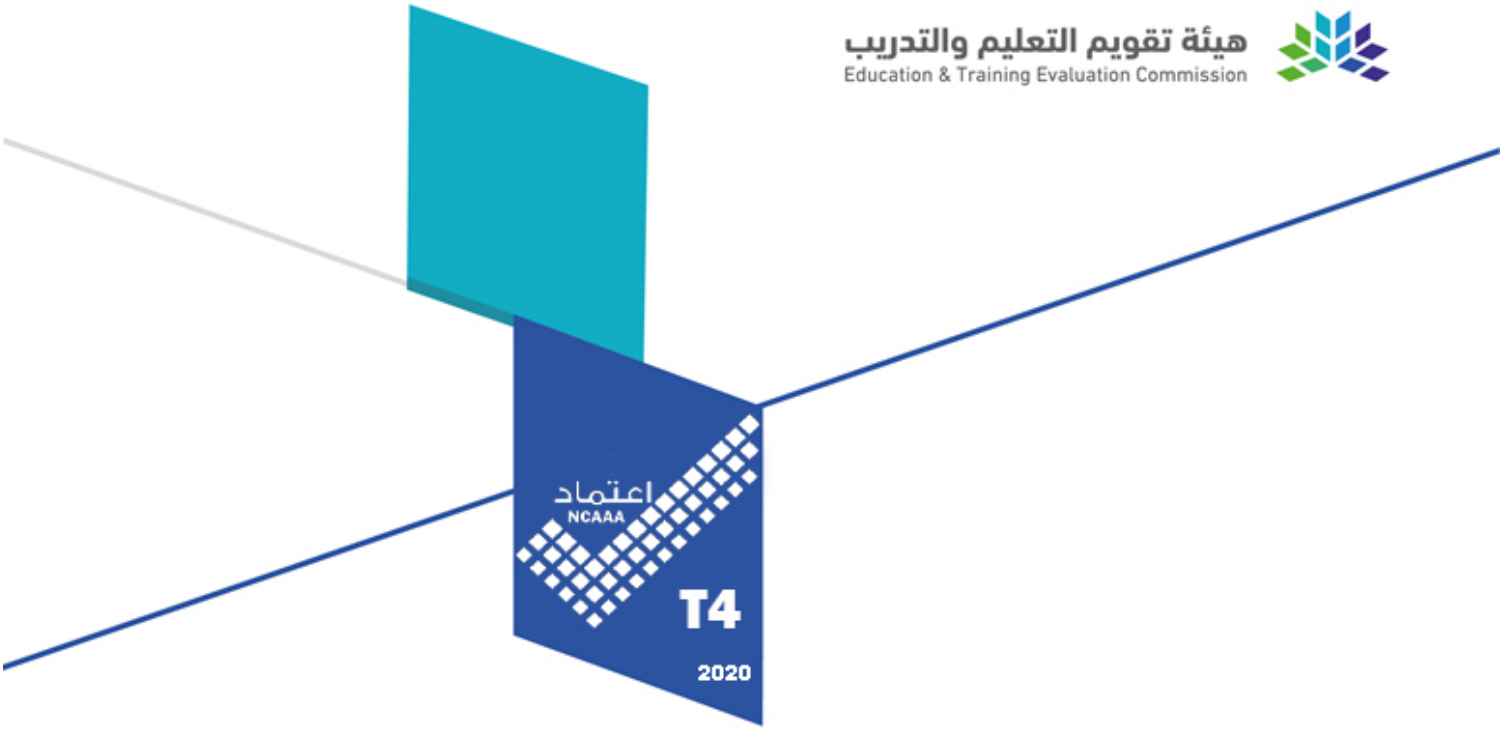
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Computational Science Principles**
Course Code:	**BSCS 3330**
Program:	**Computer Science**
Department:	**Computer Science**
College:	**Hekma School of Engineering, Computing, and Informatics**
Institution:	**Dar Al-Hekma 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:
4. Pre-requisites for this course (if any)**:** **BSCS 1330 Discrete Structures**
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**	60	%100
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

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

B. Course Objectives and Learning Outcomes

1. Course Description This course focuses on the concepts and practices of data modeling, simulation, and analysis of physical processes. It covers basic computational simulation and modeling tools, such as Python toolkit stack. The course also introduces common computational algorithms for performing scientific modeling, including computational integration and differentiation, random Monte Carlo methods and solutions of ordinary differential equations.
2. Course Main Objective The course aims at giving students the necessary background on the data modeling, simulation and the associated algorithms.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate understanding of a wide range of mathematical algorithms (such as linear regression, numerical integration and differentiation, and unconstrained optimization)	1
1.2		
1.3		
1...		
2	**Skills :**	
2.1	Use numerical or mathematical techniques to solve computational problems	6
2.2	Analyze the error caused by approximation techniques	1
2.3	Use contemporary computing software to solve complex numerical problems or simulate models.	6
2.4	Apply numerical algorithms for data modeling, simulation, and analyses	6
3	**Values:**	
3.1	Work effectively in a team to implement computational algorithms	5
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Matrix and Vectors	9
2	Linear Regression and Least Square Estimation	3
3	Interpolation	9
4	Octave Statements, Scripts, and Functions	12
5	Numerical differentiation	9
6	Numerical Integration	9
7	Optimization	9
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	Demonstrate understanding of a wide range of mathematical algorithms (such as linear regression, numerical integration and differentiation, and unconstrained optimization)	Lecture	Quiz, Midterm, Final
2.0	**Skills**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Use numerical or mathematical techniques to solve computational problems	Lecture	Assignment, Lab, Midterm, Final
2.2	Analyze the error caused by approximation techniques	Lecture	Assignment, Lab, Final
2.3	Use contemporary computing software to solve complex numerical problems or simulate models.	Lecture, hands-on technology	Lab, project
2.4	Apply numerical algorithms for data modeling, simulation, and analyses	Lecture, hands-on technology	Assignment, Midterm, Lab, Final
3.0	**Values**		
3.1	Work effectively in a team to implement computational algorithms	Lecture	Project
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz1	4	5%
2	Quiz2	9	5%
3	Lab report	14	20%
4	Midterm	7	20%
5	Project	14	20%
6	Final	15	30%
7			
8			

***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 :

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Alfio Quarteroni, Fausto Saleri, and Paola Gervasio (2018). Scientific Computing with MATLAB and Octave. 4th Edition, Springer ,ISBN: 978-3-642-45366-3
Essential References Materials	Qingkai Kong, Timmy Siauw and Alexandre M. Bayen (2020). Python Programming and Numerical Methods: A Guide for Engineers and Scientists. OCLC Number: 926614780

Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms: Furnished with a large central table or multiple small tables that can be grouped into one central table • Designed for up to 25 students • Size the room allowing 1sq meter per seat Laboratories: 25 PC's running Microsoft operating system and connected to the Internet.
Technology Resources (AV, data show, Smart Board, software, etc.)	Blackboard, data show, Octave
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

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	
Reference No.	
Date	