Program Specification
— (Bachelor)

Program: Data Science	
Program Code (as per Saudi university ranking): 061902	
Qualification Level: 6th - Bachelor of Science	
Department: Data Science	
College: Computing	
Institution: Umm Al-Qura University	
Program Specification: New ☐ updated* ☒	
Last Review Date: 29-10-1443	

*Attach the previous version of the Program Specification.

Table of Contents

A. Program Identification and General Information

1. Program's Main Location :

Makkah

2. Branches Offering the Program (if any):

None

3. Partnerships with other parties (if any) and the nature of each:

None

4. Professions/jobs for which students are qualified

- Data scientist
- Data engineer
- Data analyst
- Data architect

5. Relevant occupational/ Professional sectors:

- Data consultant
- Data manager
- Data visualization and presentation developer
- Financial data analyst
- Business intelligence developer
- Big data developer
- Big data administrator
- Data mining analyst
- Statistical systems analyst
- Machine learning systems engineer

6. Major Tracks/Pathways (if any):

Major track/pathway	Credit hours (For each track)	Professions/jobs (For each track)
1. None		

7. Exit Points/Awarded Degree (if any):

exit points/awarded degree	Credit hours
1. Computer Diploma	50

8. Total credit hours: (……………)

B. Mission, Objectives, and Program Learning Outcomes

1. Program Mission:

Provide high-quality education and research to prepare the next generation of data scientists with innovative thinking and ethical behaviors to fulfill the knowledge-based economy and industrial needs and serve the greater good of society.

2. Program Goals:

- Prepare academic cadres specialized in data science to compete at the national and global levels.

- Provide a research environment that bridges the gap between theoretical advances and practical applications in the data science domain.
- Provide a stimulating and supportive educational environment for active learning and innovation in various areas within the field of data science.
- Encourage students to be creative to find innovative solutions and applications in data science that serve society and the knowledge-based economy.
- Enhance students' experience with ethical and professional skills to enable them to solve data-driven problems in different contexts.
- Concerted efforts are underway to secure academic accreditation, serving as a testament to the excellence of the department's program and research offerings

3. Program Learning Outcomes*

Knowledge and Understanding

K1	Identify appropriate analysis tools at the data lifecycle stages to discuss design concepts and principles for data exploration and engineering, manipulation, and/or management.
K2	Explain the role of basic science, math, and technology in solving computing problems and information discovery for a wide range of applications and fields.
K3	Distinguish between the main types and methodologies used for data modeling and/or analysis.

Skills

S1	Apply appropriate mathematical, statistical, and predictive modeling using machine learning techniques to analyze data, generate insights, create value, and/or support problem solving and decision making.
S2	Design applications and creative solutions using tools for analyzing and evaluating data problems to meet needs in a specific field.
S3	Develop research methods, analysis, and standards for real-world data science problems.
S4	Apply appropriate technical and computational methods to collect, store, protect, manage, and/or interpret data in its different forms.

Values, Autonomy, and Responsibility

V1	Take the initiative to serve organizations and society by developing effective and innovative data-oriented solutions and research mechanisms.
V2	Demonstrate professional and ethical commitment when using mathematical and statistical methods when dealing with data.
V3	Communicate effectively with colleagues and stakeholders to achieve a common goal while demonstrating leadership and lifelong learning abilities.

* Add a table for each track or exit Point (if any)

C. Curriculum

1. Curriculum Structure

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Institution Requirements	Required	13	32	16.49
	Elective	3	6	3.09
College Requirements	Required	9	32	16.49
	Elective	0	0	0

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Program Requirements	Required	31	98	50.51
	Elective	3	9	4.63
Capstone Course/Project	Required	3	9	4.63
Field Training/ Internship	Required	1	8	4.12
Residency year				
Others				
Total		63	194	100

* Add a separated table for each track (if any).

2. Program Courses

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College, or Program)
Level 1	ELCE1201	English Language 1	Required		4	University
	QR1101	Holy Quran 1	Required		2	University
	SE1101	Computational Thinking & Problem Solving	Required		3	College
	MTH1105	Introduction to Calculus	Required		4	College
	CS1101	Discrete Structures (1)	Required		4	College
Level 2	ELCE1202	English Language 2	Required	English Language 1	4	University
	ICC1201	Islamic Culture 1	Required		2	University
	CS1211	Computer Programming 1	Required	Computational Thinking & Problem Solving	3	College
	PHY1110	General Physics	Required		4	College
	MTH1211	Linear Algebra 1	Required	Introduction to Calculus	4	College
Level 3	ELCE1203	English Language 3	Required	English Language 2	4	University
	BA1901	Career Preparation Skills	Required		2	University
	CS1312	Computer Programming 2	Required	Computer Programming 1	3	College
	DS1302	Topics in Computing	Required		3	College
	MTH1501	Elementary of Statistics & Probability	Required		4	College
Level 4	QR2102	Holy Quran 2	Required	Holy Quran 1	2	University
	DS2101	Introduction to Data Science	Required		3	Department

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College, or Program)
Level 5	DS2111	Applied Statistics for Data Science	Required	Statistics & Probability	3	Department
	CEN2001	Hardware Software Interface	Required	Computer Programming 2	4	Department
	MTH2102	Calculus 2	Required	Calculus	4	Department
	ICC2202	Islamic Culture 2	Required	Islamic Culture 1	2	University
	DS2221	Data Structures	Required	Computer Programming 2	3	Department
	SE2102	Foundations of Software Engineering	Required	Computer Programming 2	3	Department
	CS2342	Operating Systems Fundamentals	Required	Hardware Software Interface	4	Department
	CS2231	Database Fundamentals	Required	Computer Programming 2	3	Department
	DS2212	Data Collection and Wrangling	Required	Applied Statistics for Data Science	3	Department
Level 6	ARS1601	Arabic Writing and Editing	Required		2	University
	DS2301	Research Methods in Data Science	Required	Introduction to Data Science	3	Department
	DS2313	Data Analysis 1	Required	Data Collection and Wrangling	3	Department
	CS2315	Algorithms Fundamentals	Required	Data Structures	3	Department
	DS2302	Advanced Database Systems	Required	Database Fundamentals	3	Department
	CEN2003	Computer Networking	Required	Operating Systems Fundamentals	4	Department
Level 7	QR3103	Holy Quran 3	Required	Holy Quran 2	2	University
	DS3114	Data Analysis 2	Required	Data Analysis 1	3	Department
	DS3101	Data Management and Warehousing	Required		3	Department
	DS3122	Data Modeling 1	Required	Applied Statistics for Data Science	3	Department

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College, or Program)
	CS3251	Web Development Fundamentals	Required	Computer Programming 2 Database Fundamentals	4	Department
	DS3111	Project Management in Data Science	Required		3	Department
Level 8	XXXxxxx	University Elective 2	Elective		2	University
	ICC3203	Islamic Culture 3	Required	Islamic Culture 2	2	University
	DS3223	Data Modeling 2	Required	Calculus 2 Data Modeling 1	3	Department
	XXxxxx	Program Elective 1	Elective		3	Department
	DS3232	Data Security	Required	Computer Networking	4	Department
	AI2360	Principles and Techniques of Artificial Intelligence	Required	Algorithms Fundamentals	4	Department
Level 9	DS3388	COOP	Required		8	Department
Level 10	QR4104	Holy Quran 4	Required	Holy Quran 3	2	University
	XXXxxxx	University Elective 2	Elective		2	University
	DS4115	Probabilistic Decision Making and Risk Analysis	Required	Data Analysis 2	3	Department
	XXxxxx	Program Elective 2	Elective		3	Department
	DS4125	Applied Data Mining	Required	Data Modeling 2	3	Department
	DS4191	Capstone Project 1	Required		3	Department
Level 11	ICC4204	Islamic Culture 4	Required	Islamic Culture 3	2	University
	DS4201	Ethical Considerations in Data Science	Required		2	Department
	DS4292	Capstone Project 2	Required	Capstone Project 1	3	Department
	DS4226	Data Visualization	Required	Data Modeling 1	3	Department
	DS4203	Big Data	Required	Advanced Database Systems	3	Department
	DS4215	Business Analytics	Required	Data Analysis 2	3	Department

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College, or Program)
Level 12	DS4301	Data Policy and Governance	Required		2	Department
	XXXxxxx	University Elective 3	Elective		2	University
	DS4393	Capstone Project 3	Required	Capstone Project 2	3	Department
	DS4325	Social Media Analytics	Required	Data Analysis 2	3	Department
	DS4304	Cloud Data Management	Required	Big Data	3	Department
	XXxxxx	Program Elective 3	Elective		3	Department

* Include additional levels (for three semesters option or if needed).
** Add a table for the courses of each track (if any)

3. Course Specifications:

Insert hyperlink for all course specifications using NCAAA template (T-104)

https://uqu.edu.sa/ccomp_ds/App/FILES/27061?page=1

4. Program learning Outcomes Mapping Matrix:

Align the program learning outcomes with program courses, according to the following desired levels of performance *(I = Introduced & P = Practiced & M = Mastered).*

Course code & No.	Program Learning Outcomes										
	Knowledge and understanding				Skills				Values, Autonomy, and Responsibility		
	K1	K2	K3	---	S1	S2	S3	---	V1	V2	V3
Computational Thinking & Problem Solving		I			I						I
Introduction to Calculus		I			I				I		I
General Physics		I									I
Computer Programming 1	I					I					I
Discrete Structures 1		I			I						I
Linear Algebra 1		I			I				I		
Computer Programming 2			I			P			I		
Topics in Computing			I								I

| Course code & No. | Program Learning Outcomes | | | | | | | | | | |
| | Knowledge and understanding | | | | Skills | | | | Values, Autonomy, and Responsibility | | |
	K1	K2	K3	---	S1	S2	S3	---	V1	V2	V3
Elementary of Statistics & Probability			I		I			I	I		I
Introduction to Data Science	I						I				I
Applied Statistics for Data Science			I		I	P					I
Hardware Software Interface		I			I						I
Data Structures	I		I					I			I
Calculus 2		I			I					I	I
Foundations of Software Engineering	I					P					I
Algorithms Fundamentals	I		I					I			I
Computer Networking		P						I			
Data Collection and Wrangling	P							P		P	P
Research Methods in Data Science			P				P	P	P	P	
Data Analysis 1	P		P		P		P			P	
Database Fundamentals	P						P				P
Operating Systems Fundamentals		P					P				
Data Security	P						P	P			
Data Analysis 2		P	P		P		P	P		P	
Web Development	P					P			P		
Data Modeling 1	P	P	P		P		M	P		P	
Advanced Database Systems	P				P			P		P	
Project Management in Data Science	M							P			M
Data Modeling 2	M	P	M		P		M	P		M	

Course code & No.	Program Learning Outcomes										
	Knowledge and understanding				Skills				Values, Autonomy, and Responsibility		
	K1	K2	K3	---	S1	S2	S3	---	V1	V2	V3
Data Management and Warehousing	M							M	M		M
Principles and Techniques of Artificial Intelligence		P			P				M		
COOP	M	M	M		M	M	M	M	M	M	M
Probabilistic Decision Making and Risk Analysis		M	M		M		M		M		
Applied Data Mining	M	M			M			M	M	M	
Capstone Project 1	M	M	M		M	M	M	M	M	M	M
Ethical Considerations in Data Science	M					M	M		M		
Capstone Project 2	M	M	M		M	M	M	M	M	M	M
Data Visualization	M							M	M		
Big Data	M							M	M	M	M
Business Analytics	M		M		M	M	M		M		M
Data Policy and Governance	M					M	M		M		
Capstone Project 3	M	M	M		M	M	M	M	M	M	M
Social Media Analytics		M	M		M	M	M	M	M	M	M
Cloud Data Management	M							M	M	M	

* Add a separated table for each track (if any).

5. Teaching and learning strategies applied to achieve program learning outcomes.

Describe teaching and learning strategies, including curricular and extra-curricular activities, to achieve the program learning outcomes in all areas.

- Class lectures

- Labs
- Cognitive maps
- Asking questions
- Critical thinking
- Active learning
- Self-learning
- Problem solving
- Projects-based learning
- Modern learning resources
- Cooperative learning

6. Assessment Methods for program learning outcomes.

Describe assessment methods (Direct and Indirect) that can be used to measure the achievement of program learning outcomes in all areas.

The program should devise a plan for assessing Program Learning Outcomes (all learning outcomes should be assessed at least twice in the bachelor program's cycle and once in other degrees).

Course Assessment Methods (Direct and Indirect):
- Electronic portfolio
- Course and homework assignments
- Exams and quizzes
- Term papers and reports
- Internship performance
- Research and practical projects
- Class discussion and participation
- Case study analysis
- Rubric scores for writing, oral presentations, and performances
- Course evaluation

Program Assessment Methods (Direct and Indirect):
- Capstone projects
- Pass rates or scores on certification or subject area tests
- Exit exams
- Employer and internship supervisor ratings of students' performance
- Job placement
- Student perception surveys
- Department or program review data

D. Student Admission and Support:

1. Student Admission Requirements

1. Obtaining a high school diploma or its equivalent from inside or outside Saudi Arabia
2. Passing the required admission tests (General Aptitude Test+ Academic Achievement Test) organized by the Education & Training Evaluation Commission (the validity period of the General Aptitude Test score and the Academic Achievement Test is five years from the date of the test)
3. Weighted percentage of acceptance into a data science program, after completing the first common year.

2. Guidance and Orientation Programs for New Students

(Include only the exceptional needs offered to the students of the program that differ from those provided at the institutional level).

- Establishing an annual meeting at the university level to guide and prepare new students, in which the college, representing its departments, participates
- Establishing an induction program for new students in the department that includes an introduction to the department, the study plan, the university's academic system, rights and duties, and other relevant topics.
- Providing students with an academic advising guide.

3. Student Counseling Services

(Academic, professional, psychological and social)

(Include only the exceptional needs offered to the students of the program that differ from those provided at the institutional level).

- Providing an academic advising office
- Assigning students to academic advisors
- Forming a committee for academically struggling students
- Forming a committee for talented students
- Allocating office hours and academic advising hours for each faculty member
- Announcing schedules for office hours at the department office and on social media
- Annual academic guidance file and report
- Printing the department's guide, guiding plan, and university regulations and distributing them to students
- Holding meetings for faculty members and students to introduce the importance of academic advising
- Appointing an educational guide for the program in coordination with the relevant authorities
- Organizing Career Day activities
- Holding courses (guidance- psychological - academic)

4. Special Support

(Low achievers, disabled, gifted, and talented students).

- Organizing tutorials
- Allowing attendees to accompany them to lectures
- Enlargement of exam papers for students with visual impairments
- Writing test questions in Braille for students with visual impairments
- Preparing suitable places for students with special needs in the classrooms, library, bathroom, and parking spaces
- Providing services and facilities through the Student Support Center
- Allocating time to listen to their needs
- Providing assistants for students with special needs during exams
- Providing special testing rooms for people with special needs
- Formation of a committee for gifted and struggled students as well as scholarship students
- Organizing extra-curricular events and competitions

E. Faculty and Administrative Staff:

1. Needed Teaching and Administrative Staff

Academic Rank	Specialty		Special Requirements / Skills (if any)	Required Numbers		
	General	Specific		M	F	T
Professor	2	2		2	2	4
Associate Professor	4	2		3	3	6
Assistant Professor	10	6		8	8	16
Lecturer	4	4		4	4	8
Teaching Assistant	3	3		3	3	6
Technicians and Laboratory Assistant	3	1		2	2	3
Administrative and Supportive Staff	Administration			1	1	2
Others (specify)						

F. Learning Resources, Facilities, and Equipment:

1. Learning Resources

Learning resources required by the Program (textbooks, references, and e-learning resources and web-based resources, etc.)

Books:
- University Library
- College Library

Electronic resources:
- University Digital Library (https://uqu.edu.sa/lib)
- Saudi Digital Library (https://sdl.edu.sa/SDLPortal/en/Publishers.aspx)

Education Databases (Edu Search)

2. Facilities and Equipment

(Library, laboratories, classrooms, etc.)

- Classrooms
- Computer laboratories
- Computers
- Smart boards
- Projectors

3. Procedures to ensure a healthy and safe learning environment

(According to the nature of the program)

> Data Science Department is committed to providing a safe and healthy campus environment. Among its highest priorities are the health and safety of all faculty, staff, and students, the visiting public, and members of the neighboring community.In order to implement environmental and occupational health and safety programs and to ensure compliance with all relevant governmental laws and regulations. A variety of health care services to students, faculty, staff and community members. We accept a wide range of health insurance plans:
> • The Campus Health Clinic is located inside the main campus.
> • Smoking is prohibited in any University facility and on any University grounds.
> • First aids boxes are located in the department.
> • Fire prevention guidelines are listed in all places.
> • Emergency Exit doors in all parts with sufficient Signboards in all places.
> • Safety instructions are announced at the laboratories and the places where students gather.

G. Program Quality Assurance:

1. Program Quality Assurance System

Provide a link to quality assurance manual.

https://uqu.edu.sa/quality/123600

2. Procedures to Monitor Quality of Courses Taught by other Departments

> Random samples are requested from the course files that are taught by other departments.

3. Procedures Used to Ensure the Consistency between Main Campus and Branches (including male and female sections).

> - Identifying a coordinator for each course based on seniority in teaching the course.
> - Assigning tasks for determining the distribution of topics over weeks.
> - Determining the dates for various assessments and the questions by which the learning outcomes of the course are measured.
> - Preparing the course file after the end of the semester.
> - Reviewing course reports by the Curriculum Committee and preparing an improvement plan for each course, then submitting it to the department head.
>   - Presenting improvement plans to the department council through the department head to be discussed and approved for implementation.

4. Assessment Plan for Program Learning Outcomes (PLOs),

> Stage 1: Setting expectations for learning outcomes at the program level.
> Stage 2: Distributing tasks of evaluating the learning outcomes schedule in all stages of the program.
> Stage 3: Collecting and analyzing evaluation results.
> Stage 4: Make improvements to the program.
> This requires:
> - Developing an annual development plan based on the evaluation results.
> - Training in preparing and assessing learning outcomes.
> - Reference tests (cognitive and skill) at the end of the program, in addition to questionnaires and interviews.
> - Analyzing the results of the tests administered to program graduates.

4. Program Evaluation Matrix

Evaluation Areas/Aspects	Evaluation Sources/References	Evaluation Methods	Evaluation Time
Learning environments	Program leaders, faculty, and students	Note card Questionnaire	The length of the program
Scientific content	Faculty members	Note card Questionnaire	The length of the program
Teaching methods and strategies	Students	Note card Questionnaire	The length of the program
Student assessment methods	Faculty members and students	Note card Exams	The length of the program
Learning outcomes obtained	Program leaders and faculty members	Exams Interviews	The length of the program
Human Resources	Program leaders	Questionnaire	The length of the program

Evaluation Areas/Aspects (e.g., leadership, effectiveness of teaching & assessment, learning resources, services, partnerships, etc.)

Evaluation Sources (students, graduates, alumni, faculty, program leaders, administrative staff, employers, independent reviewers, and others.

Evaluation Methods (e.g., Surveys, interviews, visits, etc.)

Evaluation Time (e.g., beginning of semesters, end of the academic year, etc.)

6. Program KPIs*

The period to achieve the target (_____) year(s).

No.	KPIs Code	KPIs	Targeted Level	Measurement Methods	Measurement Time
1	KPI-P-01	Percentage of indicators achieved of the goals of the program's operational plan	70%	Questionnaire and interviews	End of year
2	KPI-P-02	Students' evaluation of the quality of learning experiences in the program	70%	Questionnaire	End of year
3	KPI-P-03	Students' evaluation of the quality of the courses	70%	Questionnaire and interviews	End of year
4	KPI-P-04	Apparent completion rate	70%	Results Analysis Cards	End of each semester
5	KPI-P-05	Retention rate for first year students	60%	Reports	End of year
6	KPI-P-06	Student performance in professional and / or national tests	70%	Results Analysis Cards	End of year
7	KPI-P-07	Employment of graduates and their enrollment in graduate programs	80% Employment 20% Graduate Programs	Questionnaire and interviews	At the end of the program
8	KPI-P-08	Average number of students in a class	20	Reports	During the program
9	KPI-P-09	Evaluation of employment agencies for the efficiency of	80%	Questionnaire and interviews	At the end of the program

No.	KPIs Code	KPIs	Targeted Level	Measurement Methods	Measurement Time
		program graduates			
10	KPI-P-10	Student satisfaction with the services provided	90%	Questionnaire and interviews	End of term
11	KPI-P-11	The ratio of students to faculty	1:20	Reports	End of term
12	KPI-P-12	Beneficiaries' satisfaction with learning resources	80%	Questionnaire and interviews	During the program

*including KPIs required by NCAAA

H. Specification Approval Data:

Council / Committee	Data Science Department
Reference No.	
Date	2 June 2024