

BS (Hons) - DS

[Bachelor of Studies (Honours) – Data Science]

ELIGIBILITY CRITERIA:

The candidate has passed the Intermediate or equivalent examination with Mathematics securing at least 50% marks in aggregate from an institution recognized by the Higher Education Commission of Pakistan / Inter Board Committee of Chairmen, Pakistan.

*Equivalency certificate by IBCC will be required in case of education from some other country or system.

- The students who have not studied Mathematics at intermediate level have to pass deficiency courses of Mathematics (06 credits) in first two semesters.

PROGRAM STRUCTURE:

(Program is equivalent to 16 years of education)

Minimum Duration: 4 years; through 8 regular semesters (Fall/Spring)

Minimum Credits: 132

STRUCTURE A- SINGLE MAJOR

The breakup of these 132 Credits is as follows:

Category	Credits	No. of Courses
General Education	39	13
Distribution Courses	39	13
Major	54	18
Internship	Non Credit (compulsory)	-
PLL	Non Credit (compulsory)	-

STRUCTURE B- ONE MAJOR + ONE MINOR

The breakup of these 132 Credits is as follows:

Category	Credits	No. of Courses
General Education	39	13
Distribution Courses	30	10
Major	51	17
Minor	12	4
Internship	Non Credit (compulsory)	-
PLL	Non Credit (compulsory)	-

STRUCTURE C- DOUBLE MAJOR

The breakup of these 132 Credits is as follows:

Category	Credits	No. of Courses
General Education	39	13
Distribution Courses	15	5
Major 1	39	13
Major 2	39	13
Internship	Non Credit (compulsory)	-
PLL	Non Credit (compulsory)	-

STRUCTURE D- SINGLE MAJOR + TWO MINOR

The breakup of these 132 Credits is as follows:

Category	Credits	No. of Courses
General Education	39	13
Distribution Courses	18	6
Major	45	15

Minor 1	15	5
Minor 2	15	5
Internship	Non Credit (compulsory)	-
PLL	Non Credit (compulsory)	-

STRUCTURE E- ASSOCIATE DEGREE (60 CREDIT HOURS)

The breakup of these 60 Credits is as follows:

Category	Credits	No. of Courses
General Education	39	13
Distribution Courses	6	2
Major	15	5

GENERAL EDUCATION - COMPULSORY COURSES

Total: 39

Credits

Category	Courses	Code	Title of Course	Credits
Arts & Humanities	2	GENL151	1. Functional Urdu	2
		GENL252	2. Translation of Holy Quran <i>(for Muslim Students)</i> DR	4
		GENL253	Principles of Ethics <i>(for Non-Muslim Students)</i>	4
		GENL324	3. Sports and Exercise Physiology	3
		GENL434	4. Short Film and Drama Production	3
		GENL435	5. Cultural Heritage in Pakistan	3
Natural Sciences	2	GENL121	1. Environmental Sciences	3
		GENL122	2. Fundamentals of Applied Physics	3
		GENL123	3. Every Day Science	3
		GENL124	4. Geography and Natural Resources	3
		GENL125	5. Introduction to Ecology	3
	2	GENL101	1. Introduction to Political Science	3

Social Sciences		GENL102	2. Introduction to International Relations	3
		GENL103	3. Introduction to Sociology	3
		GENL131	4. Population Studies	3
		GENL132	5. Legal Systems of Pakistan	3
		GENL231	6. Gender Studies	3
Expository Writing	3	GENL161	1. Expository I: Functional Composition & Comprehension	3
		GENL262	2. Expository II: Communication and Academic Writing	3
		GENL263	3. Exposition III: Technical writing & Presentation Skills	3
Quantitative Reasoning	2	GENL111	1. Elements of Statistics & Probability	3
		GENL112	2. General Mathematics	3
		GENL113	3. Introduction to Mathematical Reasoning	3
		GENL114	4. Introduction to Information and Communication Technology	3+1
		GENL115	5. Logic and Critical Thinking	3
Islamiyat / Moral Values	1	GENL141	1. Fundamentals of Islamic Studies (For Muslim Students) OR	3
		GENL142	Moral Values (for Non-Muslim Students)	3
Pakistan Studies	1	GENL143	Pakistan Studies	3

COURSES OF STUDY :

(Information about the Prerequisites (if any) of the course(s) will be provided by the Department at the beginning of the program)

COURSE FOR MAJORING IN DATA SCIENCE :

A. Single Major in Data Science (without any Minor)

Distribution courses for Single Major:

Total: (39 Credits)

Subject to University offerings, the student shall opt 39 credits from the list below:

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
MATH112	Discrete Structures for CSC	3
MATH113	Calculus and Analytical Geometry for CSC	3
MATH212	Linear Algebra for CSC	3
MATH233	Differential Equations	3
BUSS273	Professional Practices	3
CRSC121	Programming Fundamentals	4
CRSC221	Object Oriented Programming	4
CRSC222	Data Structure and Algorithms	3

CRSC242	Database Management Systems	4
CRSC251	Introduction to Software Engineering	3
CRSC331	Computer Networks	3+1
CRSC422	Information Security	3

Major courses for Single Major: Total: (42 Credits)

Subject to University offerings, the student shall opt 42 credits from the list below:

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
CRSC211	Digital Logic Design	4
CRSC223	Operating Systems	3
CRSC312	Artificial Intelligence	4
CRSC323	Design and Analysis of Algorithms	3
CRSC326	Computer Architecture and Assembly Language	4
CRSC434	Parallel and Distributed Computing	3
STAT373	Advance Statistics	3
CRSC438	Introduction to Data Science	3
CRSC441	Data Mining	3
CRSC443	Data Warehousing and Business Intelligence	3
CRSC444	Data Visualization	3
CRSC445	Big Data Analytics	3
CRSC486	Final Year Project in BS (DS)	6

Electives Courses

Total: (12 Credits)

Subject to University offerings, the student shall opt four courses from the list below:

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
CRSC313	Theory of Automata and Formal Languages	3
CRSC348	Advance Database Management Systems	3
CRSC349	Business Process Analysis	3
CRSC413	Programming for Artificial Intelligence	3
CRSC414	Machine Learning	3
CRSC415	Artificial Neural Networks	3
CRSC423	Deep Learning	3
CRSC424	Speech Processing	3
CRSC429	Agent Based Modeling	3
CRSC446	Text Mining	3
CRSC447	Topics in Data Science	3
CRSC448	Platform and Architecture for Data Science	3
CRSC457	Cloud Computing	3
CRSC458	Privacy Preservation	3

B. Major in Data Science (alongside One Minor)

Distribution courses for Single Major and One Minor: Total: (30 credits)

Subject to University offerings, the student shall opt 30 credits from the list below:

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
MATH112	Discrete Structures for CSC	3
MATH113	Calculus and Analytical Geometry for CSC	3
MATH212	Linear Algebra for CSC	3
MATH233	Differential Equations	3
BUSS273	Professional Practices	3
CRSC121	Programming Fundamentals	4
CRSC221	Object Oriented Programming	4
CRSC222	Data Structure and Algorithms	3
CRSC242	Database Management Systems	4
CRSC251	Introduction to Software Engineering	3
CRSC331	Computer Networks	3+1
CRSC422	Information Security	3

Major courses for Single Major and One Minor: Total: (42 Credits)

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
CRSC211	Digital Logic Design	4
CRSC223	Operating Systems	3
CRSC312	Artificial Intelligence	4
CRSC323	Design and Analysis of Algorithms	3
CRSC326	Computer Architecture and Assembly Language	4
CRSC434	Parallel and Distributed Computing	3
STAT373	Advance Statistics	3
CRSC438	Introduction to Data Science	3
CRSC441	Data Mining	3
CRSC443	Data Warehousing and Business Intelligence	3
CRSC444	Data Visualization	3
CRSC445	Big Data Analytics	3
CRSC486	Final Year Project in BS (DS)	6

Electives Courses Total: 9 Credits

Subject to University offerings, the student shall opt three courses from the list below:

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
CRSC313	Theory of Automata and Formal Languages	3
CRSC348	Advance Database Management Systems	3
CRSC343	Business Process Analysis	3

CRSC413	Programming for Artificial Intelligence	3
CRSC414	Machine Learning	3
CRSC415	Artificial Neural Networks	3
CRSC423	Deep Learning	3
CRSC424	Speech Processing	3
CRSC429	Agent Based Modeling	3
CRSC446	Text Mining	3
CRSC447	Topics in Data Science	3
CRSC448	Platform and Architecture for Data Science	3
CRSC457	Cloud Computing	3
CRSC458	Privacy Preservation	3

C. Double Major in Data Science (with Computer Science Major)

Distribution courses for Double Major: *Total: (15 Credits)*

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
MATH112	Discrete Structures for CSC	3
MATH233	Differential Equations	3
MATH212	Linear Algebra for CSC	3
MATH113	Calculus and Analytical Geometry for CSC	3
BUSS273	Professional Practices	3

**Major courses in Computer Science (alongside another Major in Data Science)
*Total: (39 Credits)***

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
CRSC121	Programming Fundamentals	4
CRSC221	Object Oriented Programming	4
CRSC222	Data Structure and Algorithms	3
CRSC223	Operating Systems	3
CRSC242	Database Management Systems	4
CRSC251	Introduction to Software Engineering	3
CRSC311	Theory of Automata	3
CRSC323	Design and Analysis of Algorithms	3
CRSC324	Compiler Construction	3
CRSC331	Computer Networks	3+1
CRSC343	Fundamentals of Graph Theory	3
CRSC344	Theory of Programming Languages	3
CRSC422	Information Security	3
CRSC482	Final Year Project	6

Major courses in Data Science (alongside another Major in CS) Total: (39 Credits)

Subject to University offerings, the student shall opt 39 credits from the list below:

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
CRSC211	Digital Logic Design	4
CRSC312	Artificial Intelligence	4
CRSC326	Computer Architecture and Assembly Language	4
CRSC434	Parallel and Distributed Computing	3
STAT373	Advance Statistics	3
CRSC438	Introduction to Data Science	3
CRSC441	Data Mining	3
CRSC443	Data Warehousing and Business Intelligence	3
CRSC444	Data Visualization	3
CRSC445	Big Data Analytics	3
CRSC486	Final Year Project in BS (DS)	6

D. Major in Data Science (alongside two Minors)**Distribution courses for Single Major and Two Minors: Total: (18Credits)**

Subject to University offerings, the student shall opt 18 credits from the list below:

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
MATH112	Discrete Structures for CSC	3
MATH113	Calculus and Analytical Geometry for CSC	3
MATH212	Linear Algebra for CSC	3
MATH233	Differential Equations	3
BUSS273	Professional Practices	3
CRSC223	Operating Systems	3
CRSC251	Introduction to Software Engineering	3
CRSC422	Information Security	3

Major courses for DS alongside Minor in CS and any other Minor**Total: (45 Credits)**

Subject to University offerings, the student shall opt 45 credits from the list below:

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
CRSC211	Digital Logic Design	4
CRSC221	Object Oriented Programming	4
CRSC312	Artificial Intelligence	4
CRSC323	Design and Analysis of Algorithms	3
CRSC326	Computer Architecture and Assembly Language	4
CRSC434	Parallel and Distributed Computing	3
STAT373	Advance Statistics	3

CRSC438	Introduction to Data Science	3
CRSC441	Data Mining	3
CRSC443	Data Warehousing and Business Intelligence	3
CRSC444	Data Visualization	3
CRSC445	Big Data Analytics	3
CRSC486	Final Year Project in BS (DS)	6

Minor in Computer Science (alongside Major in DS and Minor in another discipline)

Total: 5 courses

<u>Course Code</u>	<u>Title of Course</u>	<u>Credits</u>
CRSC121	Programming Fundamentals	4
CRSC222	Data Structure and Algorithms	3
CRSC242	Database Management Systems	4
CRSC225	Web Engineering	3
CRSC331	Computer Networks	3+1