Degree Program

Master of Science in Data Science

Revised Curriculum (For Spring 2023 and Onwards)

Department of Creative Technologies

Faculty of Computing and Artificial Intelligence (FCAI),

Air University, Islamabad

Introduction:

The Master of Science in Data Science (DS) degree program, offered at the Department of Creative Technologies, Air University, Islamabad, aims to provide students an opportunity to be part of a data science endeavor that begins with the identification of business processes, determination of data provenance and data ownership, understanding the ecosystem of the business decisions, skill sets and tools that shape the data, making data amenable to analytics, identifying sub-problems, recognizing the technology matrix required for problem resolution, creating incrementally-complex data-driven models, and maintaining data-driven models for business growth. The degree program focuses on equipping students with skills and expertise to transform data into actionable insights to make complex business decisions. This degree program is aligned with the latest trends and demands of the local and international markets, and the department aims to produce highly skilled researchers in the field to meet our country's current and future demands for data scientist in government, industries, businesses, applied sciences, and research. This degree program also provides leverage to gain hands-on experience on data-centric tools for statistical analysis, visualization, and big-data applications at the same rigorous scale as in a practical data science project. Air University expects its MS(DS) graduates to pursue careers as data science experts in either academia or industry.

Eligibility Criteria:

A prospective applicant to the MS(DS) program is required to meet the following minimum eligibility criteria:

a. Bachelor's (or Master's) degree in the subject of Computer Science/Artificial Intelligence/Data Science/Information Technology/Mathematics/Statistics/Bioinformatics/ Biomedical Science/Aviation Sciences/Aviation Management, or Engineering (Computer/ Software/Electronics/Telecom/Mechatronics/Biomedical/Avionics/Aerospace/ Naval Architecture), earned from the HEC recognized university/ institute, after completing 16 years of education with a CGPA of at least 2.00 (on the scale of 4.00), or first division in the annual system.

b. GRE (General) with a minimum score of 151 in Quantitative Reasoning, 145 in Verbal Reasoning, and 3.5 out of 6 in Analytical Writing), or GAT (General) with at least 50% score. In case of non-availability of GRE/GAT (General) due to any reason, the concerned department may arrange an equivalent test under the auspices of Air University, and the applicant must score at least 60% in the test to become eligible for admission.

Program Structure:

The two-year MS(DS) degree program comprises both coursework as well as a research component. There are three core courses (in addition to the "Research Methodology" course), two specialization core courses, and three electives, aimed at strengthening the understanding, skills, and competence of students in fundamental and advanced domains of DS. The distribution of total credit hours for the MS(DS) degree program is given below.

Category/Area	No. of Courses	Credit Hours (Cr. Hrs.)
Core Courses	04	10
Specialization Core Courses	02	06
Elective Courses	03	09
Non-Credit Course	01	-

MS Thesis	-	06
Total Credit Hours		**31**

Award of Degree Requirements:

For the award of MS(DS) degree, a student must have:

- Passed courses totaling at least 31 credit hours, including the core courses
- Obtained a CGPA of 2.5 or more on a scale of 4.00

Semester-Wise Study Plan for MS-DS (Revised, Spring 2023):

The semester-wise breakdown of total credit hours for the MS(DS) program is as follows:

S. #.	Course Title	Cr. Hrs.
Semester–I		
1	Statistical and Mathematical Methods for Data Analysis (Core-I)	**03**
2	Tools and Techniques for Data Science (Core II)	**03**
3	Research Methodology (Core-III)	**01**
4	Machine Learning (Core-IV)	**03**
*5	Applied Programming **(* Non-Credit)**	* 01 (0-1-1)
Semester Cr. Hrs.		**10**
Semester–II		
1	Elective-I	**03**
2	Specialization Core – Elective I	**03**
3	Specialization Core – Elective II	**03**
Semester Cr. Hrs.		**09**
Semester–III		
1	Elective-II	**03**
2	Elective-III	**03**
3	MS Thesis	**06**
Semester Cr. Hrs.		**12**
Semester–IV		
1	MS Thesis (Continue…)	-
Semester Cr. Hrs.		**-**
Total Cr. Hrs.		**31**
***** The "Applied Programming" course is of no credit and will be offered only to the students having deficiencies in the programming skills.		

*** Policy for Undertaking "Applied Programming" Course:** The Applied Programming course is of no credit and shall not be counted towards the CGPA of students. The course consists of 01 Cr. Hr. of lab and will be undertaken by MS students having deficiencies in their programming skills. The course will be graded as Pass/Fail only. In this respect, the department will conduct a Programming Skills Assessment Test (PSAT) for the students after their enrollment in the MS(DS) program. The students must pass this test with a score of at least 50% to showcase their programming skills. The students who fail to score 50% marks in the test will have to undertake and pass the Applied Programming course in the first semester. The students who fail to score 50% marks in the test will have to undertake and pass the Applied Programming course in the first semester.

List of Core Courses:

Below is a list of the four (04) core courses for the MS-DS program.

S. #.	Course Title	Credit Hours
1	Statistical and Mathematical Methods for Data Analysis	03
2	Tools and Techniques for Data Science	03
3	Machine Learning	03
4	Research Methodology	01
Total Credit Hours		**13**

The students are required to choose any two (02) courses among the following courses from the specialization core courses list.

S. #.	Course Title	Credit Hours
1	Distributed Data Processing	03
2	Big Data Analytics	03
3	Deep Learning	03
4	Natural Language Processing	03

List of Elective Courses:

The list of elective courses offered by the department for the MS(DS) degree program is given below.

Sr. No.	Course Title	Cr. Hrs.
1.	Data Privacy	03
2.	Computational and Bayesian Statistics	03
3.	Advanced Database Administration and Management	03
4.	Algorithmic Trading	03
5.	Optimization Methods for Data Science and Machine Learnir	03
6.	Timeseries Analysis and Prediction	03
7.	Data Mining: Advanced Concepts and Algorithms	03
8.	Real-Time Stream Processing	03
9.	Cloud Computing	03
10.	High Performance Computing	03
11.	Business Intelligence and Analytics	03
12.	Operations Data Analysis	03
13.	Scientific Computing in Finance	03
14.	Reliability and Survival Analysis	03
15.	Computer Vision: From Theory to Applications	03
16.	Data Visualization	03
17.	Social Network Analysis	03
18.	Computational Genomics	03
19.	Bioinformatics	03

**** Important Note:** For elective courses, an MS(DS) student may study any course within the department as recommended by the academic supervisor/chairman/Guidance and Evaluation Committee (GEC). However, only graduate-level courses or equivalent will be counted towards the coursework requirements of an MS(DS) student. In addition, a student may choose to study the elective courses from the selective list of courses offered at other departments, as given below.

List of Elective Courses from Other Departments:

Sr. No.	Course Title	Cr. Hrs.
1.	Computational Linguistics	03
2.	Cloud Computing Security	03
3.	Soft Computing Systems	03
4.	Principles of Real-Time Computing	03
5.	General Linguistics	03
6.	Cognitive Linguistics	03
7.	Advanced Cognitive Linguistics	03
8.	Advanced Pragmatics	03
9.	Digital Marketing	03
10.	Applied Marketing Analytics	03
11.	Applied Multivariate Statistics	03
12.	Descriptive Analytics and Data Visualization	03
13.	Enterprise Business Intelligence	03
14.	Advanced Statistical Techniques	03
15.	Optimization Techniques	03
16.	Marketing Data Mining	03
17.	Geographical Information Systems	03
18.	Distributed Computing	03
19.	Stochastic Processes	03
20.	Computer Forensics	03

Applicability of Revised Curriculum:

The updated curriculum is applicable to the Spring 2023 and onward sessions.