



Degree Program

Master of Science in Software Engineering

Curriculum (For Spring 2023 and Onwards)

**Department of Creative Technologies,
Faculty of Computing and Artificial Intelligence (FCAI),
Air University, Islamabad**

For Spring 2023 and Onwards

Introduction:

The Master of Science in Software Engineering (SE) degree program, offered at the Department of Creative Technologies, Air University, Islamabad, is designed to prepare the students for a professional career in Software Design and Development. In addition to the current state of the art trends in the software industry, the program also inculcates AI-Augmented Software Engineering knowledge to the students. The main objectives of this program are as follow:

- Prepare students to become successful software engineers by inculcating broad knowledge of concepts, principles, and techniques in the discipline of Software Engineering, including Software Design and Development, Software Quality Assurance, Project Management and AI-augmented Software Engineering.
- Prepare students to analyze and interpret complex real-world problems using a system-of-systems thinking, architecture & design thinking and systems analysis.
- Prepare students for productive employment in the software industry, to pursue their higher studies in local and international universities.
- Prepare students to work collaboratively, with consideration of professional ethics and demonstrate initiative on complex software development projects.
- To support the software development sector's growth by training the next generation software engineers in AI-augmented Software Engineering in Pakistan.

This degree program also provides leverage to the students for conducting research in core and advanced areas of SE. Air University expects its MS(SE) graduates to pursue careers as experts in either academia or industry.

Eligibility Criteria:

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

- a. Bachelor's (or Master's) degree in the subject of Science (Computer Science/Artificial Intelligence/Data Science/Information Technology) or Engineering (Computer/Software/Electrical/Electronics/Telecom), 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.

Important Note: Students may have to cover the following deficiency courses if required:

- a. Software Engineering
- b. Probability and Statistics

Program Structure:

The two-year MS(SE) degree program comprises both coursework as well as a research component. There are four core courses and five electives, aimed at strengthening the understanding, skills, and competence of students in fundamental and advanced domains of SE. The distribution of total credit hours for the MS(SE) degree program is given below.

For Spring 2023 and Onwards

Category/Area	No. of Courses	Credit Hours (Cr. Hrs.)
Core Courses	04	10
Elective Courses	05	15
Non-Credit (NC) Course	01	-
MS Thesis	-	06
Total Credit Hours		31

Award of Degree Requirements:

For the award of MS(SE) 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-SE (From Fall 2022):

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

S. #.	Course Title	Cr. Hrs.
Semester-I		
1	Advanced Software Engineering (Core-I)	03
2	Advanced Requirements Engineering (Core-II)	03
3	Research Methodology (Core-III)	01
4	Elective-I	03
*5	*Applied Programming (* Non-Credit)	* 01 (0-1-1)
Semester Cr. Hrs.		10
Semester-II		
1	Software Testing and Quality Assurance (Core-IV)	03
2	Elective-II	03
3	Elective-III	03
Semester Cr. Hrs.		09
Semester-III		
1	Elective-IV	03
2	Elective-V	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

For Spring 2023 and Onwards

MS(SE) 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.

List of Core Courses:

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

S. #.	Course Title	Credit Hours
1	Advanced Software Engineering	03
2	Advance Requirements Engineering	03
3	Software Testing and Quality Assurance	03
4	Research Methodology	01
Total Credit Hours		10

List of Elective Courses:

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

Sr. No.	Course Title	Cr. Hrs.
1.	Advanced Formal Methods	03
2.	Agent Oriented Software Engineering	03
3.	Software Project Management	03
4.	Stochastic Processes Modelling	03
5.	Statistics for Software Engineering	03
6.	Selected Topics in System-of-Systems Engineering	03
7.	Data Mining: Advanced Concepts and Algorithms	03
8.	Cognitive Science	03
9.	Empirical Software Engineering	03
10.	Advanced Human Computer Interaction	03
11.	Component Based Software Engineering	03
12.	Communications in HCI	03
13.	User-Centered Research and Evaluation	03
14.	Information and Interaction Design	03
15.	Programming Usable Interfaces	03
16.	Computer Game Design	03
17.	Mixed Reality Experience Design	03
18.	Human-Robot Interaction	03
19.	Business and Marketing Strategy	03
20.	Communications for Software Engineers	03
21.	Software Risk Management	03
22.	Software Measurement and Metrics	03
23.	Software Configuration Management	03
24.	Selected Topics in Software Project Management	03
25.	Agile Software Development Methods	03
26.	Information Visualization	03
27.	Game AI	03

For Spring 2023 and Onwards

28.	Usability Testing	03
29.	Quantitative Model Checking	03
30.	Machine Learning	03
31.	Event-Driven Computing	03
32.	Evolutionary Computing	03
33.	Knowledge Graphs	03
34.	Explainable Artificial Intelligence	03
35.	Reliability Engineering	03
36.	Ubiquitous Computing and Intelligent Systems	03
37.	Selected Topics in Intelligent Systems	03
38.	Statistical Relational Artificial Intelligence	03
39.	Secure Software Engineering	03
40.	Network and Cloud Security	03
41.	Selected Topics in Information and Secure Software Engineering	03
42.	Mobile and Wireless Systems	03
43.	High-Performance Computing	03
44.	Service Oriented Architectures	03
45.	Complex Networks	03
46.	Internet of Things and Sensor Networks	03

*** Important Note:** For elective courses, an MS(SE) 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(SE) 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.	Soft Computing Systems	03
3.	Principles of Real-Time Computing	03
4.	Digital Marketing	03
5.	Descriptive Analytics and Data Visualization	03
6.	Advanced Statistical Techniques	03
7.	Optimization Techniques	03
8.	Marketing Data Mining	03
9.	Semantic Web	03
10.	Virtual Reality	03
11.	Geographical Information Systems	03
12.	Natural Language Processing	03
13.	Distributed Computing	03
14.	Computer Forensics	03
15.	Advanced Network Security	03
16.	Cloud Computing Security	03

For Spring 2023 and Onwards

Applicability of Revised Curriculum:

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