



Degree Program

**Doctor of Philosophy in Artificial Intelligence
Curriculum (For Spring 2023 and Onwards)**

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

1. Program Introduction

Artificial Intelligence (AI) is a rapidly growing field in the world. In this field, the machines are designed and programmed to think and act like a human. With time, AI is becoming essential for human life because of its massive applications in diverse fields, such as banking and financial systems, biomedical sciences, disease diagnoses and treatment, heavy industries, air transportation, gaming zones, surveillance and security, disaster management, traffic management and urban planning, agriculture, intelligent systems, and robotics. The main goal of the Ph.D. (AI) program is to establish a research-oriented environment for AI and its applications and produce highly skilled professionals to become innovators and entrepreneurs who would fulfill the market's demand for the betterment of society. The program's vision is to achieve excellence through the knowledge and research in AI to foster the economic growth of Pakistan. The program focuses on making our research scholars expert in the subjects, techniques, methods, models, tools, and research in this domain and relevant areas/applications. This degree program is aligned with the latest trends and demands of the local and international markets and is designed with the following aims and objectives:

1. To promote research in interdisciplinary domains of AI applications across different departments in the university
2. To analyze the existing theories in AI and create new theories for evaluating complex problems and developing advanced solutions to AI challenges
3. To produce highly-skilled researchers in the field to meet our country's current and future demands for AI employment in government, industries, businesses, applied sciences, research, health, and security
4. To attract international jobs/companies by creating a local pool of talented and skilled AI experts
5. To contribute towards establishing the AI industry in Pakistan
6. To make Air University Islamabad a pioneer in this field at the national level and set it as an internationally renowned university for AI
7. To attract international students from the neighboring countries to bring a good name to Air University and improve the University ranking at the national and international level

The research and development in interdisciplinary domains of AI applications can solve many daily routine problems and improve our lifestyle by offering products in many disciplines such as smart homes, smart cities, smart agriculture, smart vehicles, business intelligence, smart surveillance, and smart health-care. Thus, this degree program aims to equip our students/scholars with the latest technologies and essential skills in AI, covering both theoretical and practical aspects.

2. Admission/Eligibility Criteria

The applicant has to meet the following minimum eligibility requirements for admission to Ph.D. (AI) program.

- i.MS/MPhil 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

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from the HEC recognized university/institute, after completing 18 years of education, meeting 30 Credit Hours with a CGPA of at least 3.00 (on the scale of 4.00), or first division in the annual system.

- ii. GRE Subject (International) or GAT Subject, with at least 60% score in relevant discipline. In case of non-availability of GRE/GAT Subject due to any reason, the concerned department may arrange an equivalent test under the auspices of Air University. The applicant must score 70% in this test to become eligible for admission.

Important Note: Students from diverse backgrounds can also apply for admission. However, such students may require undertaking the additional course(s) to alleviate their weaknesses in programming-related skillset. The roadmap of the additional course(s) will be prepared by the Guidance and Evaluation Committee (GEC) for each student during the first semester.

3. Program Structure

The distribution of total Credit Hours (Cr. Hrs.) for the Ph.D. (AI) program is as follows:

Category/Area	Credit Hours
Coursework (06 Elective Courses)	18
Ph.D. Thesis/Dissertation	30
Total Credit Hours	48

Important Note:

A student must take the “Research Methodology” course of 01 Credit Hour as an additional course if he/she did not study this course during his/her MS degree program. This will add one more credit and make a total of 49 Cr. Hrs.

4. Semester-Wise Study Plan for Ph.D. (AI) Program

The semester-wise breakdown of total Cr. Hrs. for the Ph.D. (AI) program is as follows:

S. #.	Course Title	Credit Hours (Cr. Hrs.)
Semester I		
1	Coursework (Elective-I)	3-0-3
2	Coursework (Elective-II)	3-0-3
3	Coursework (Elective-III)	3-0-3
Semester Cr. Hrs.		09
*4	*Research Methodology	01
Semester Cr. Hrs.		10
* The Research Methodology course is mandatory for the students who did not study this course in their MS degree program.		
Semester II		
1	Coursework (Elective-IV)	3-0-3
2	Coursework (Elective-V)	3-0-3
3	Coursework (Elective-VI)	3-0-3
Semester Cr. Hrs.		09

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Semester III		
1	Comprehensive Exam	
2	Ph.D. Thesis	30
Semester Cr. Hrs.		30
Semester IV		
1	Ph.D. Thesis (Continue...)	-
Semester V		
1	Ph.D. Thesis (Continue...)	-
Semester VI		
1	Ph.D. Thesis (Continue...)	-
Total Cr. Hrs.		48

5. Program Courses

The program curriculum consists of elective courses as there is no core course for this degree program. The list of elective courses offered by the department for the Ph.D. (AI) degree program is given below.

List of Elective Courses:

Sr. No.	Course Title	Cr. Hrs.
1.	Medical Image Processing and Analysis	3
2.	Computer Vision: From Theory to Applications	3
3.	Knowledge Engineering	3
4.	Knowledge Graphs for Explainable Artificial Intelligence	3
5.	Statistical Relational Artificial Intelligence	3
6.	Artificial Intelligence for Data Analysis and Visualization	3
7.	Intelligent Video Analytics	3
8.	Brain-Computer Interface	3
9.	Pattern Classification and Recognition	3
10.	Artificial Intelligence in Automation	3
11.	Internet of Things and Sensor Networks	3
12.	Ubiquitous Computing and Intelligent Systems	3
13.	Remote Sensing	3
14.	Multi-Agent Systems	3
15.	Design of Intelligent Information Systems	3
16.	Web Mining	3
17.	Social Network Analysis	3
18.	Logistics and Supply Chain Intelligence	3
19.	Artificial Intelligence in Information Security	3
20.	Advanced Analysis of Algorithms	3
21.	Advanced Artificial Intelligence	3
22.	Deep Learning	3
23.	Natural Language Processing	3
24.	Deep Reinforcement Learning	3
25.	Bioinformatics	3
26.	Artificial Intelligence in Sports Analytics	3
27.	Special Topics in Artificial Intelligence	3

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28.	Special Topics in Computer Vision	3
29.	Special Topics in Human-Computer Interaction	3
30.	Stochastic Processes	3
31.	Special Topics in Explainable Artificial Intelligence	3
32.	Artificial Intelligence of Things	3
33.	Special Topics in Sensors and Sensing	3
34.	Intelligent Transportation Systems	3
35.	Special Topics in Ubiquitous Computing	3
36.	Neuro-Symbolic Information Systems	3
37.	Special Topics in Information Systems	3
38.	Special Topics in Artificial Intelligence for Cyber Security	3
39.	Special Topics in Natural Language Processing	3
40.	Special Topics in Deep Learning	3
41.	Neurocomputation	3
42.	Special Topics in Artificial Intelligence for Healthcare	3

*** Important Note:** Due to the interdisciplinary nature of the Ph.D. (AI) degree program, the course curriculum is not just limited to the list of elective courses as listed above. A Ph.D. (AI) student may study any graduate-level course within the university as recommended by the academic supervisor/chairman/Guidance and Evaluation Committee (GEC). Multiple departments at the university (including, but not limited to, Electrical, Mechatronics, Computer Science, Cyber Security, Avionics, etc.) can offer Ph.D. level courses for the Ph.D. (AI) program. **The roadmap for elective/additional courses, comprising the minimum of 18 Credit Hours coursework requirement, will be prepared on an individual basis for each student by the Guidance and Evaluation Committee (GEC) during the first semester. The elective/additional courses, determined by the GEC, will further need to be approved by the Faculty Boards of Studies of the parent department as well as the department conducting the elective/additional course. Only graduate-level courses (with a course code of 700-800 level) will be counted towards the coursework requirements of a Ph.D. student.** A Ph.D. student must undertake at least 50% of courses with a course code of 800 level.