

BS Artificial Intelligence

■ Program Educational Objectives (PEOs)

The BS(AI) program aims to produce leading professionals who will:

- (i) Contribute competently in the computing industry by applying requisite technical skills.
- (ii) Demonstrate advancement in computing profession by enhancing their knowledge and skills in Artificial Intelligence.
- (iii) Demonstrate ethical values and contribute positively towards the society.

■ Program Learning Outcomes (PLOs)

At the time of graduation, the graduates of BS(AI) program will possess the following attributes

- (i) **Academic Education:** To prepare graduates as computing professionals.
- (ii) **Knowledge for Solving Computing Problems:** Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.
- (iii) **Problem Analysis:** Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

- (iv) **Design/Development of Solutions:** Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- (v) **Modern Tool Usage:** Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.
- (vi) **Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.
- (vii) **Communication:** Communicate effectively with the computing community and with society at large about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.
- (viii) **Computing Professionalism and Society:** Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.
- (ix) **Ethics:** Understand and commit to professional ethics, responsibilities, and norms of professional computing practice.
- (x) **Lifelong Learning:** Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

■ Admission Requirements

- (i) Higher Secondary School Certificate or equivalent securing at least 50% marks in aggregate with Mathematics.
- (ii) CUST Admission Test/HEC Approved Test

■ Degree Requirements

Each candidate for the BS Artificial Intelligence (AI) degree is required to successfully earn 137 credit hours (Cr. Hrs.) as per the following detail:

Area	Cr. Hrs.
a) General Education	34
b) Major Courses	73
c) Allied Courses	12
d) Elective Courses	09
e) Capstone Project	06
f) Internship	03
Total	137

■ General Courses (34 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Functional English	AIG1113	3
Expository Writing	AIG1123	3
Islamic Studies/Ethics	AIG1012	2
Ideology and Constitution of Pakistan	AIG1022	2
Personal Grooming	AIG2212	2
Applied Physics	AIG1312	2
Applied Physics Lab	AIG1311	1
Sociology	AIG1412	2
Calculus and Analytical Geometry	AIG1513	3
Discrete Structures	AIG1573	3
Applications of Information and Communication Technologies	AIG1612	2
Applications of Information and Communication Technologies Lab	AIG1611	1
Entrepreneurship	AIG2712	2
Civics and Professional Ethics	AIG2812	2
Fehm-ul-Quran I	AIG1021	1

Fehm-ul-Quran II	AIG1031	1
Pakistan Studies	AIG1032	2

■ Major Courses (73 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Introduction to Programming	AI1133	3
Introduction to Programming Lab	AI1131	1
Object Oriented Programming	AI1143	3
Object Oriented Programming Lab	AI1141	1
Database Systems	AI2313	3
Database Systems Lab	AI2311	1
Digital Logic Design	AI2512	2
Digital Logic Design Lab	AI2511	1
Data Structures	AI2143	3
Data Structures Lab	AI2141	1
Information Security	AI3712	2
Information Security Lab	AI3711	1
Artificial Intelligence	AI2812	2
Artificial Intelligence Lab	AI2811	1
Computer Networks	AI3772	2
Computer Networks Lab	AI3771	1
Software Engineering	AI3223	3
Computer Organization & Assembly Language	AI3522	2
Computer Organization & Assembly Language Lab	AI3521	1
Operating Systems	AI2412	2
Operating Systems Lab	AI2411	1
Analysis of Algorithms	AI3163	3
Programming for Artificial Intelligence	AI2822	2
Programming for Artificial Intelligence Lab	AI2821	1
Machine Learning	AI3812	2
Machine Learning Lab	AI3811	1
Artificial Neural Networks & Deep Learning	AI3842	2

Artificial Neural Networks & Deep Learning Lab	AI3841	1
Knowledge Representation and Reasoning	AI3312	2
Knowledge Representation and Reasoning Lab	AI3311	1
Computer Vision	AI3832	2
Computer Vision Lab	AI3831	1
Parallel & Distributed Computing	AI3432	2
Parallel & Distributed Computing Lab	AI3431	1
Data Mining	AI4322	2
Data Mining Lab	AI4321	1
Advanced Statistics	AI4072	2
Advanced Statistics Lab	AI4071	1
HCI and Computer Graphics	AI4272	2
HCI and Computer Graphics Lab	AI4271	1
Swarm Intelligence	AI4812	2
Swarm Intelligence Lab	AI4811	1
Financial Accounting	ACA14003	3

■ Allied Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Multivariable Calculus	MTAI2053	3
Linear Algebra	MTAI2033	3
Probability & Statistics	MTAI2063	3
Technical & Business Writing	HMAI4033	3

■ Elective Courses (09 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Elective-I (Natural Language Processing)	AI4822	2
Elective-I (Natural Language Processing Lab)	AI4821	1
Elective-II (Speech Processing)	AI4882	2
Elective-II (Speech Processing Lab)	AI4881	1
Elective-III (Reinforcement Learning)	AI4852	2
Elective-III (Reinforcement Learning Lab)	AI4851	1

■ Capstone Project (6 Cr. Hrs.)

After the completion of 90 Cr. Hrs. the students are required to demonstrate their practical skills in the field of computer science by designing and implementing a design project worth 6 Cr. Hrs. The project shall be completed in two parts as given below:

Course Title	Code	Cr. Hrs.
Design Project-I	AI4912	2
Design Project-II	AI4924	4

■ Internship

It is mandatory for every student to participate in a 6-8 weeks summer internship program following their 6th semester or after the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Internship	AI4103	3

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite to clear the student for the award of degree.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is a four years degree program comprising of 8 semesters with a minimum of 137 Cr. Hrs. There will be a Fall and a Spring semester in each year. The summer semester will be utilized for internship or deficiency courses. The maximum duration to complete BS Artificial Intelligence degree is 07 years.

Note: Degree requirements may be modified from time to time as per the directions of the concerned regulatory body.

SCHEME OF STUDIES

BS Artificial Intelligence

□ Semester-I (15 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
AI1133	Introduction to Programming	3
AI1131	Introduction to Programming Lab	1
AIG1612	Applications of Information & Communication Technologies	2
AIG1611	Applications of Information & Communication Technologies Lab	1
AIG1513	Calculus and Analytic Geometry	3
AIG1113	Functional English	3
AIG1022	Ideology and Constitution of Pakistan	2

□ Semester-II (18 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
AI1143	Object Oriented Programming	3
AI1141	Object Oriented Programming Lab	1
AIG1012	Islamic Studies/Ethics	2
AIG1573	Discrete Structures	3
AIG1123	Expository Writing	3
AIG1312	Applied Physics	2
AIG1311	Applied Physics Lab	1
AIG1032	Pakistan Studies	2
AIG1021	Fehm-ul-Quran-I	1

□ Semester-III (17 Cr. Hrs)

Course Code	Course Title	Cr. Hrs.
AI2143	Data Structures	3
AI2141	Data Structures Lab	1
AI2313	Database Systems	3
AI2311	Database System Lab	1
AI2822	Programming for AI	2

AI2821	Programming for AI Lab	1
MTAI2033	Linear Algebra	3
AIG2412	Sociology	2
AIG1031	Fehm-ul-Quran-II	1

□ **Semester-IV (18 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
AI2412	Operating Systems	2
AI2411	Operating Systems Lab	1
AI2512	Digital Logic Design	2
AI2511	Digital Logic Design Lab	1
AI2812	Artificial Intelligence	2
AI2811	Artificial Intelligence Lab	1
AIG2812	Civics and Professional Ethics	2
MTAI2063	Probability and Statistics	3
AIG2212	Personal Grooming	2
AIG2712	Entrepreneurship	2

□ **Semester-V (18 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
AI3163	Analysis of Algorithms	3
AI3522	Computer Organization & Assembly Language	2
AI3521	Computer Organization & Assembly Language Lab	1
AI3812	Machine Learning	2
AI3811	Machine Learning Lab	1
AI3432	Parallel and Distributed Computing	2
AI3431	Parallel and Distributed Computing Lab	1
AI3223	Software Engineering	3
AI3772	Computer Networks	2
AI3771	Computer Networks Lab	1

□ **Semester-VI (15 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
AI3842	Artificial Neural Networks & Deep Learning	2
AI3841	Artificial Neural Networks & Deep Learning Lab	1
AI3832	Computer Vision	2
AI3831	Computer Vision Lab	1
AI3312	Knowledge Representation and Reasoning	2
AI3311	Knowledge Representation and Reasoning Lab	1
AI3712	Information Security	2
AI3711	Information Security Lab	1
MTAI3053	Multivariable Calculus	3

□ **Semester-VII (17 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
AI4272	HCI and Computer Graphics	2
AI4271	HCI and Computer Graphics Lab	1
AI4322	Data Mining	2
AI4321	Data Mining Lab	1
AI4823	Elective-I (Natural Language Processing)	3
AI4072	Advanced Statistics	2
AI4071	Advanced Statistics Lab	1
HMAI4033	Technical & Business Writing	3
AI4912	Design Project-I	2

□ **Semester-VIII (16 Cr. Hrs)**

Course Code	Course Title	Cr. Hrs.
AI4812	Swarm Intelligence	2
AI4811	Swarm Intelligence Lab	1
AI4853	Elective-II (Reinforcement Learning)	3
AI4893	Elective-III (Game Theory)	3
ACAI4003	Financial Accounting	3
AI4924	Design Project-II	4

Master of Artificial Intelligence

■ Admission Requirements

- (i) A minimum of 16 years of education leading to BS in Artificial Intelligence / Data Science / Computer Science / Information Technology / Software Engineering / Mathematics or equivalent recognized by HEC
- (ii) Minimum 2.00/4.00 CGPA or 50% marks
- (iii) Admission Test / HEC Approved Test

■ Degree Requirements

A student admitted in this program will have to complete the degree requirements by following any one of the options given below:

- (i) 24 Cr. Hrs. course work with 2 Cr. Hrs. Fahm-ul-Quran and 6 Cr. Hrs. Thesis
- (ii) 30 Cr. Hrs. course work (10 courses) with 2 Cr. Hrs. Fahm-ul-Quran

Area	Cr. Hrs.
a) Core Courses	12
b) Elective Courses (with / without thesis)	12/18
c) Research Thesis	06
d) General Education	02
Total	32

■ General Education (02 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Fehm-ul-Quran I	AIG7021	1
Fehm-ul-Quran II	AIG7031	1

■ Core Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Advanced Machine Learning	AI7813	3
Applied Artificial Intelligence	AI7823	3
Advanced Analysis of Algorithms	AI7833	3
Mathematics for Artificial Intelligence	AI7843	3

■ Elective Courses (12 Credit Hours)

Course Title	Code	Cr. Hrs.
Data Mining	AI78x3	3
Information Retrieval	AI88x3	3
Applied Natural Language Processing	AI88x3	3
Heuristic Methods for Optimization	AI88x3	3
Pattern Recognition	AI88x3	3
Fuzzy Systems	AI88x3	3
Deep Learning	AI88x3	3
Advanced Computer Vision	AI88x3	3
Applied Neural Networks	AI88x3	3
Multi-Agent Systems	AI88x3	3

■ CGPA Requirement

A student is required to earn a minimum of 3.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is normally a two years program comprising of 4 semesters with minimum 32 semester credit hours. There will be a fall and a spring Semester in each year. The Maximum duration to complete MS in Artificial Intelligence is 4 years.



