BS Software Engineering

■ Program Educational Objectives (PEOs)

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

(i) Contribute competently in the software industry by applying requisite technical skills.

(ii) Demonstrate advancement in software engineering profession by enhancing their knowledge and skills.

(iii) Demonstrate ethical values and contribute positively towards the society.

■ Program Learning Outcomes (PLOs)

At the time of graduation, the graduates of BS(SE) 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 16 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 multidisciplinary 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) **Life-long 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 Software Engineering degree is required to successfully earn 130 credit hours as per the following detail:

	Area	Cr. Hrs.
(a)	Core Courses	57
(b)	Elective Courses	15
(c)	Supporting Science Courses	12
(d)	SE Domain Supporting Courses	09
(e)	General Education Courses	31
(f)	Internship	0
(g)	Community Service	0
(h)	Design Project	6
	Total	**130**

Core Courses (57 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Introduction to Programming	SE1133	3
Introduction to Programming Lab	SE1131	1
Object Oriented Programming	SE1143	3
Object Oriented Programming Lab	SE1141	1
Data Structures	SE2143	3
Data Structures Lab	SE2141	1
Software Engineering-I	SE2223	3
Introduction to Database Systems	SE2313	3
Introduction to Database Systems Lab	SE2311	1
Discrete Structures	SE2053	3

Operating Systems	SE3413	3
Operating Systems Lab	SE3411	1
Computer Communications and Networks	SE3773	3
Computer Communications and Networks Lab	SE3771	1
Introduction to Information Security and Forensics	SE3713	3
Software Architecture and Design	SE3312	2
Software Architecture and Design Lab	SE3311	1
Human Computer Interaction	SE3273	3
Software Requirement Engineering	SE3263	3
Software Quality Engineering	SE3613	3
Software Project Management	SE4273	3
Software Re-engineering	SE4283	3
Software Construction and Development	SE3512	2
Software Construction and Development Lab	SE3511	1
Web Engineering	SE3523	3

■ **Elective Courses (15 Cr. Hrs.)**

Course Title	Code	Cr. Hrs.
Software Engineering-II	SE3233	3
Formal Software Specification	SE3223	3
Software Engineering Processes	SE3253	3
Software Configuration and Change Management	SE4723	3
Component Based Development	SE4293	3
Software Engineering Economics	SE4233	3
Service Oriented Architecture	SE4263	3
Developing Reusable Software	SE4513	3
Evolutionary Software Testing	SE4623	3
Agent Based Software Engineering	SE4313	3
Software Metrics	SE4253	3
Cloud Computing	SE4563	3
Global Software Development	SE4523	3
Web Application Development	SE4713	3

Mobile Application Development	SE4193	3
Enterprise Application Development	SE4183	3
Software Quality Assurance & Testing	SE4243	3
Semantic Web	SE4323	3
Information Visualization	SE4193	3
Automated Software Testing	SE4343	3
Software Design Patterns	SE3543	3
Natural Language Processing	SE4763	3
Model Based Software Testing	SE4363	3
Rapid Application Development	SE3243	3
Secure Software Development	SE3283	3
Artificial Intelligence	SE4813	3
Machine Learning	SE4613	3
Malware Analysis	SE4873	3
Penetration Testing	SE4893	3
Blockchain Technology	SE4573	3
Introduction to Data Science	SE4883	3
Web Security and Forensics	SE4863	3
Database Security	SE3823	3
Data Security and Cryptography	SE3843	3
Web Frameworks	SE4463	3
Internet of the Things	SE4743	3
Advanced Database Systems	SE3323	3
Mobile Application Security and Testing	SE4913	3
Computer Game Programming	SE3173	3
Wireless Security	SE4833	3
Image Systems Engineering	SE3943	3

■ **Supporting Science Courses (12 Cr. Hrs.)**

Course Title	Code	Cr. Hrs.
Calculus and Analytical Geometry	MTSE1013	3
Linear Algebra	MTSE1033	3
Applied Physics	PHSE1013	3
Probability and Statistics	MTSE3063	3

SE Domain Supporting Courses (09 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Business Process Engineering	SE3833	3
Formal Methods in Software Engineering	SE4113	3
Operations Research	SE3913	3
Simulation and Modeling	SE3923	3
Stochastic Processes	SE3933	3

General Education Courses (31 Cr. Hrs)

Course Title	Code	Cr. Hrs.
Pakistan Studies	HMSE1002	2
Islamic Studies	HMSE1012	2
English-I (Functional English)	HMSE1013	3
English-II (Communication Skills)	HMSE1023	3
Technical Report Writing	HMSE2033	3
Personal Management and Grooming	HMSE1033	3
Professional Ethics and Legal Issues	HMSE2013	3
Humanities-I	HMSE2xx3	3
Humanities-II	HMSE2xx3	3
Management-I	MGSE4xx3	3
Management-II	MGSE4xx3	3

Design Project (6 Cr. Hrs)

After the completion of 90 Cr. Hrs. the students are required to demonstrate their practical skills in the field of Software Engineering 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	SE4912	2
Design Project-II	SE4924	4

■ Internship (SE4100)

It is mandatory for every student to register in a 6-8 week summer internship program following their 6th semester or after the completion of 90 credit hours. A formal evaluation is carried out and Pass/Fail grade is awarded to the student.

■ Community Service (VIS4000)

It is mandatory for every student to get involved in 65 hours community service during summer (not allowed when student is registered for internship) following their 4th semester or after completion of 50 credit hours.

■ 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-year degree program comprising of 8 semesters with minimum of 133 semester credit hours (Cr. Hrs). There will be a Fall and a Spring semester in each year. The Summer semester will be utilized for internships or deficiency courses. The maximum duration to complete BS is 7 years.

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

SCHEME OF STUDIES
BS Software Engineering

☐ Semester-I (15 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
PHSE1013	Applied Physics	Supporting Science	3
SE1133	Introduction to Programming	Core	3
SE1131	Introduction to Programming Lab	Core	1
HMSE1013	English-I	General Education	3
MTSE1013	Calculus and Analytical Geometry	Supporting Science	3
HMSE1002	Pakistan Studies	General Education	2

☐ Semester-II (18 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
SE1143	Object Oriented Programming	Core	3
SE1141	Object Oriented Programming Lab	Core	1
HMSE1023	English-II	General Education	3
MTSE1033	Linear Algebra	Supporting Science	3
SE2053	Discrete Structures	Core	3
HMSE2053	Humanities-I	General Education	3
HMSE1012	Islamic Studies	General Education	2

☐ Semester-III (17 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
SE2143	Data Structures	Core	3
SE2141	Data Structures Lab	Core	1
SE2313	Introduction to Database Systems	Core	3
SE2311	Introduction to Database Systems Lab	Core	1
HMSE3123	Humanities-II	General Education	3
HMSE2033	Technical Report Writing	General Education	3
MTSE3063	Probability and Statistics	Supporting Science	3

☐ **Semester-IV (17 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
HMSE1033	Personal Management and Grooming	General Education	3
SE2223	Software Engineering-I	Core	3
SE3773	Computer Communications and Networks	Core	3
SE3771	Computer Communications and Networks Lab	Core	1
SE3413	Operating Systems	Core	3
SE3411	Operating System Lab	Core	1
SE3263	Software Requirement Engineering	Core	3

☐ **Semester-V (18 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
HMSE2013	Professional Ethics and Legal Issues	General Education	3
SE3713	Introduction to Information Security and Forensics	Core	3
SE3312	Software Architecture and Design	Core	2
SE3311	Software Architecture and Design Lab	Core	1
SE3273	Human Computer Interaction	Core	3
SE3xx3	SE Domain I	SE Domain	3
SE3xx3	Elective-I	Elective	3

☐ **Semester-VI (18 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
SE3613	Software Quality Engineering	Core	3
SE3512	Software Construction and Development	Core	2
SE3511	Software Construction and Development Lab	Core	1
SE3523	Web Engineering	Core	3
SE3xx3	SE Domain II	SE Domain	3
SE3xx3	Elective-II	Elective	3
SE3xx3	Elective-III	Elective	3

☐ **Semester-VII (17 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
SE4273	Software Project Management	Core	3
SE4813	Software Re-Engineering	Core	3
MGSE4xx3	Management-I	General Education	3
SE4912	Design Project Part-I	Project	2
SE3xx3	SE Domain III	SE Domain	3
SE4xx3	Elective-IV	Elective	3

☐ **Semester-VIII (10 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
MGSE4xx3	Management-II	General Education	3
SE4924	Design Project Part-II	Project	4
SE4xx3	Elective-V	Elective	3

BS Artificial Intelligence

The computing field has created impact in almost every aspect of human life. During the past couple of decades, computing has not only developed as a discipline itself but it has also accelerated the advancement in other disciplines. Different sub-domains have been emerging in computing with the passage of time, like computer science, software engineering etc. A recent major development in computing is emergence of Artificial Intelligence (AI). This can be mainly contributed to the availability of abundance of data and capability to capture and process this huge amount of data. The AI has created huge impact in different walks of life including medical, business, entertainment and many others. As a subject, AI has evolved resulting Artificial, Convolutional and Recurrent Neural Networks. A recent advancement in AI is the Reinforcement Learning. All these developments in AI have resulted in amazing products in image processing, computer vision, voice recognition, natural language processing and many others.

In order to keep pace with the rest of the world and to prepare a trained workforce in this important and emerging field, the Department of Computer Science plans to offer a bachelor degree in AI, that is, BS(AI). The program has been structured after number of meetings among different stakeholders from industry and academia. The degrees being offered at different schools of the world have been studied, evaluated and discussed. In order to make it compatible with the requirements of regulators, the degree has been mainly structured as per the guidelines of computing council. On the other hand, the contents, delivery and evaluations have been made competitive with the top institutions of the world. After a thorough working in the structuring of degree, it is believed that the BS(AI) program offered at CUST will create a difference and huge impact in the market in the years to come.

■ 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 131 credit hours (Cr. Hrs.) as per the following detail:

	Area	Cr. Hrs.
(a)	Computing Core	40
(b)	Artificial Intelligence Core	18
(c)	Artificial Intelligence Electives (AE)	21
(d)	Elective Supporting Courses	03
(e)	Math and Supporting Courses	12
(f)	General Education	31
(g)	Internship	00
(h)	Design Project	06
	Total	**131**

Computing Core (40 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	AI2223	3
Computer Organization & Assembly Language	AI2522	2
Computer Organization & Assembly Language Lab	AI2521	1
Operating Systems	AI3412	2
Operating Systems Lab	AI3411	1
Analysis of Algorithms	AI3163	3

Artificial Intelligence Core (18 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
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 & Reasoning	AI3312	2
Knowledge Representation & Reasoning Lab	AI3311	1

Computer Vision	AI3832	2
Computer Vision Lab	AI3831	1
Parallel and Distributed Computing	AI3432	2
Parallel and Distributed Computing Lab	AI3431	1

■ **Artificial Intelligence Electives (21 Cr. Hrs.)**

Course Title	Code	Cr. Hrs.
Natural Language Processing	AI3822	2
Natural Language Processing Lab	AI3821	1
Speech Processing	AI3882	2
Speech Processing Lab	AI3881	1
Data Mining	AI2322	2
Data Mining Lab	AI2321	1
Advanced Statistics	AI3072	2
Advanced Statistics Lab	AI3071	1
Reinforcement Learning	AI3852	2
Reinforcement Learning Lab	AI3851	1
Swarm Intelligence	AI4812	2
Swarm Intelligence Lab	AI4811	1
HCI & Computer Graphics	AI4272	2
HCI & Computer Graphics Lab	AI4271	1

■ **Math and Supporting Courses (12 Cr. Hrs.)**

Course Title	Code	Cr. Hrs.
Multivariable Calculus	MTAI1053	3
Linear Algebra	MTAI1033	3
Probability & Statistics	MTAI2063	3
Technical & Business Writing	MTAI4033	3

■ **Elective Supporting Courses (03 Cr. Hrs.)**

Course Title	Code	Cr. Hrs.
Social Science (Example: Introduction to Marketing)	MKTAI4013	3
Social Science (Example: Financial Accounting)	MGAI4023	3

■ General Education (31 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Application of Information & Communication Technologies	HMAI1032	2
Application of I & CT Lab	HMAI1031	1
Functional English	HMAI1013	3
Expository Writing	HMAI023	3
Quantitative Reasoning – 1 (Discrete Structures)	MTAI2053	3
Quantitative Reasoning – 2 (Calculus and Analytic Geometry)	MTAI1013	3
Islamic Studies	HMAI1012	2
Ideology and Constitution of Pakistan	HMAI4002	2
Social Sciences (Example: Introduction to Management)	MGAI1003	3
Natural Sciences (Applied Physics)	PHAI1012	2
Natural Sciences (Applied Physics) Lab	PHAI1011	1
Arts & Humanities (Professional Practices)	HMAI4012	2
Civics and Community Engagement	HMAI4062	2
Entrepreneurship	MGAI4002	2

■ Design Project (06 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 bellow:

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

■ Internship (AI4103)

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

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 (16 Cr. Hrs.)

Course Code	Course Title	Category	Cr. Hrs.
AI1133	Introduction to Programming	Computing Core	3
AI1131	Introduction to Programming Lab	Computing Core	1
HMAI1032	Application of ICT	General Education	2
HMAI1031	Application of ICT Lab	General Education	1
PHAI1012	Applied Physics	General Education	2
PHAI1011	Applied Physics Lab	General Education	1
MTAI1013	Calculus and Analytical Geometry	General Education	3
HMAI1013	Functional English	General Education	3

☐ Semester-II (18 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
AI1143	Object Oriented Programming	Computing Core	3
AI1141	Object Oriented Programming Lab	Computing Core	1
HMAI1023	Expository Writing	General Education	3
HMAI1012	Islamic Studies	General Education	2
AI2512	Digital Logic Design	Computing Core	2
AI2511	Digital Logic Design Lab	Computing Core	1
MTAI1053	Multivariable Calculus	Math and Supporting	3
MTAI2053	Discrete Structures	General Education	3

☐ Semester-III (19 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
AI2143	Data Structures	Computing Core	3
AI2141	Data Structures Lab	Computing Core	1
AI2313	Database Systems	Computing Core	3
AI2311	Database Systems Lab	Computing Core	1
AI2812	Artificial Intelligence	Computing Core	2

AI2811	Artificial Intelligence Lab	Computing Core	1
MTAI1033	Linear Algebra	Math and Supporting	3
MTAI2063	Probability and Statistics	Math and Supporting	3
MGAI1003	Introduction to Management	General Education	2

☐ Semester-IV (18 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
AI3412	Operating Systems	Computing Core	2
AI3411	Operating Systems Lab	Computing Core	1
AI3772	Computer Networks	Computing Core	2
AI3771	Computer Networks Lab	Computing Core	1
AI2522	Computer Organization & Assembly Language	Computing Core	2
AI2521	Computer Org. & Assembly Language Lab	Computing Core	1
AI2223	Software Engineering	Computing Core	3
AI2822	Programming for Artificial Intelligence	AI Core	2
AI2821	Programming for Artificial Intelligence Lab	AI Core	1
AI2322	Data Mining	AI Elective	2
AI2321	Data Mining Lab	AI Elective	1

☐ Semester-V (18 Cr. Hrs)

Course Code	Course Title	Category	Cr. Hrs.
AI3712	Information Security	Computing Core	2
AI3711	Information Security Lab	Computing Core	1
AI3163	Analysis of Algorithms	Computing Core	3
AI3812	Machine Learning	AI Core	2
AI3811	Machine Learning Lab	AI Core	1
AI3432	Parallel and Distributed Computing	AI Core	2
AI3431	Parallel and Distributed Computing Lab	AI Core	1
AI3312	Knowledge Representation and Reasoning	AI Core	2
AI3311	Knowledge Representation and Reasoning Lab	AI Core	1
AI3822	Natural Language Processing	AI Elective	2
AI3821	Natural Language Processing Lab	AI Elective	1

☐ **Semester-VI (15 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
AI3832	Computer Vision	AI Core	2
AI3831	Computer Vision Lab	AI Core	1
AI3842	Artificial Neural Networks & Deep Learning	AI Core	2
AI3841	Artificial Neural Networks & DL Lab	AI Core	1
AI3072	Advanced Statistics	AI Elective	2
AI3071	Advanced Statistics Lab	AI Elective	1
AI3852	Reinforcement Learning	AI Elective	2
AI3851	Reinforcement Learning Lab	AI Elective	1
AI3882	Speech Processing	AI Elective	2
AI3881	Speech Processing Lab	AI Elective	1

☐ **Semester-VII (13 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
AI4912	Final Year Project-I	Computing Core	2
AI4272	HCI & Computer Graphics	AI Elective	2
AI4271	HCI & Computer Graphics Lab	AI Elective	1
MKAI4013	Introduction to Marketing	Elective Supporting	3
HMAI4033	Technical and Business Writing	Math and Supporting	3
HMAI4002	Ideology and Constitution of Pakistan	General Education	2

☐ **Semester-VIII (13 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
AI4924	Final Year Project-II	Computing Core	4
HMAI4012	Professional Practices	General Education	2
HMAI4062	Civics and Community Engagement	General Education	2
AI4812	Swarm Intelligence	AI Elective	2
AI4811	Swarm Intelligence Lab	AI Elective	1
MGAI4002	Entrepreneurship	General Education	2

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 6 Cr. Hrs. Thesis

(ii) 30 Cr. Hrs. course work (10 Courses)

Core Courses (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Advanced Machine Learning	AI5813	3
Applied Artificial Intelligence	AI5823	3
Advanced Analysis of Algorithms	AI5833	3
Mathematics for Artificial Intelligence	AI5843	3

Elective Courses (12 Credit Hours)

Course Title	Code	Cr. Hrs.
Data Mining	AI58x3	3
Information Retrieval	AI68x3	3
Applied Natural Language Processing	AI68x3	3
Heuristic Methods for Optimization	AI68x3	3
Pattern Recognition	AI68x3	3
Fuzzy Systems	AI68x3	3
Deep Learning	AI68x3	3
Advanced Computer Vision	AI68x3	3
Applied Neural Networks	AI68x3	3
Multi-Agent Systems	AI68x3	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 30 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.

SCHEME OF STUDIES
MS Artificial Intelligence

☐ **Semester-I (12 Cr. Hrs.)**

Course Code	Course Title	Category	Cr. Hrs.
AI5843	Mathematics for Artificial Intelligence	Core	3
AI5823	Applied Artificial Intelligence	Core	3
AI68x3	Elective I	Elective	3
AI68x3	Elective II	Elective	3

☐ **Semester-II (12 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
AI5813	Advanced Machine learning	Core	3
AI5833	Advanced Analysis of Algorithms	Core	3
AI68x3	Elective III	Elective	3
AI68x3	Elective IV	Elective	3

☐ **Semester-III (03 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
AI68x3	Thesis I / Elective V	Elective	3

☐ **Semester-IV (03 Cr. Hrs)**

Course Code	Course Title	Category	Cr. Hrs.
AI68x3	Thesis II / Elective VI	Elective	3