Annexure I

Course Curriculum for Executive MTech in Artificial Intelligence & Data Science

Computer Science and Engineering Department

AY 2024-2025

NATIONAL INSTITUTE OF TECHNOLOGY DELHI

(An autonomous Institute under the aegis of Ministry of Education,Govt. of India.)

Department of Computer Science and Engineering
National Institute of Technology Delhi

NIT Delhi started its academic session in 2010 with three undergraduate B.Tech degree programmes in Computer Science and Engineering, Electronics and Communication Engineering and Electrical and Electronics Engineering. The academic activities of NIT Delhi were initiated at NIT Warangal in 2010 which later moved to a temporary campus at Dwarka, New Delhi in June 2012 and then shifted to IAMR Campus, Narela in February 2014. Currently, NIT Delhi is operating from its permanent campus at Plot No. FA7, Zone P1, GT Karnal Road, Delhi-110036, India.

The Institute has secured a remarkable NIRF 51st rank in 2023 among 4000 engineering colleges in India. The highest package awarded to the students of NIT Delhi is Rs. 82 LPA in 2023 and the average package awarded to the students of NIT Delhi is Rs. 17.72 LPA.

1. About the Department

The Computer Science and Engineering Department was started in 2010 along with the foundation of NIT Delhi. Initially, only the Bachelor of Technology Programme was offered with the intake 30 which presently has been increased to 120. Now, apart from B. Tech., the department also offers Master of Technology in CSE,CSE (Analytics) and Ph.D. programmes which cover a number of important areas of Computer Science and Engineering, e.g., Algorithms, Computer Networks, Data Warehousing and Data Mining, Software Engineering, Machine Learning, Image Processing, Web Technologies, Data Analytics, Complex Networks, Wireless Sensor Networks etc. The department now also offers a Btech programme in Artificial Intelligence & Data Science, with a sanctioned intake of 20 students. We provide our students with a broad undergraduate and graduate curriculum based on the application and theoretical foundations of computer science.

Our faculty and students participate in interdisciplinary research. The combination of these elements makes the department an especially exciting environment in which to study and work; an environment that serves us well in our goal of providing excellence in education, research, and discovery. The

department envisions producing quality graduates, capable of leading the world in the technical realm. The department is equipped with the latest configuration and high computing system with hi-speed Internet facility, both wired as well as wi-fi. The Computer Science programs at this institute are dedicated to educate students and to advance research in computer and information technology. The department has all the facilities to carry out the related teaching and research work.

Vision of Department

- To communicate quality Computer Science education for producing globally identifiable technocrats and entrepreneurs upholding sound ethics, profound knowledge, and innovative ideas to meet industrial and societal expectations.

Mission of Department

- To impart value-based technical knowledge and skill relevant to Computer Science and Engineering through effective pedagogies and hands-on experience on the latest tools and technologies to maximise employability.
- To strengthen multifaceted competence in allied areas of Computer Science in order to nurture creativity and innovations to adapt the ever-changing technological scenario requiring communally cognizant solutions.
- To create an appetite for research that leads to pursuing a research career or higher education in contemporary and emerging areas of computer science.
- To inculcate the moral, ethical, and social ideals essential for prosperous nation building.

Executive M. Tech. in Artificial Intelligence & Data Science

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2.1 Salient Features

- Minimum Credits requirements for completion of M. Tech program is 80.
- The Curriculum is based on the guidelines of National Education Policy (NEP) – 2020.
- The curriculum is designed to meet the prevailing and ongoing industrial requirements.
- The curriculum is flexible and offers Choice Based Credit System (CBCS).
- The curriculum inherits the Value based Education and offers Interdisciplinary/ Multidisciplinary Courses.
- The Curriculum offers Digital Pedagogy & Flipped Learning with adequate motivation for Entrepreneurship/ Startups.
- The curriculum aims at the Holistic Development of the students.
- In the proposed PG scheme the CSE department is proposing in 02 different following specializations;
    1. Artificial Intelligence and Machine Learning (Bouquet 1)
    2. Data Science (Bouquet 2)
- The programme is of two years duration with two semesters in each year.

3. Program Overview

M.Tech in Artificial Intelligence & Data Science is a two-year program that offers students a comprehensive vision of the technologies of Artificial intelligence and Data Science. The M.Tech Artificial Intelligence & Data Science curriculum is divided into six semesters of four months each. This course has been designed for professionals across industries so that they can become the protagonist of a revolution in the making by getting hands-on knowledge of AI implementation while building the next generation business models.

3.1 Program Objectives

1. Understand the fundamentals of artificial intelligence, its evolution and challenges.
2. Acquire knowledge about principles and concepts of pattern recognition, computational intelligence, probabilistic graphical models, neural networks and deep learning algorithms.
3. Apply artificial intelligence towards problem solving, perception, knowledge representation and learning.
4. Develop machine learning models and apply them to real-world problems.
5. Analyse various state-of-the-art algorithms and techniques of Artificial Intelligence and Data Science in interdisciplinary fields of research.

3.2 Core Program Outcomes

By the end of the program the students will be able to:

- Demonstrate the conceptual as well as hands-on knowledge of Artificial intelligence and data science including machine learning, deep learning and reinforcement learning.
- Understand the system requirements in order to deal with large data sets and run deep learning models.
- Analyze complex AI application areas and solve the respective problems using appropriate techniques.
- Carry out research and development work independently in the field of artificial intelligence to solve practical problems.
- Understand the threats and ethical concerns in using Artificial intelligence.

3.3 Semester wise Credit Structure

Credits						Total
Sl. No.		**1st Year**		**2nd Year**		
		Semester I	**Semester II**	**Semester III**	**Semester IV**	
1	Program Core (PC)	10	7	-	-	17
2	Elective	3	6	-	-	9
3	MOOC Courses	3	3	3	3	12
4	Core Lab	4	4	-	-	8
2	Seminar (SEM)	-	-	1	1	2
3	Minor Project	-	-	16	-	16
4	Major Project	-	-	-	16	16
Total		**20**	**20**	**20**	**10**	**80**

4. Course Scheme

	Semester I							Semester II					
	Course Code	**Course Name**	**L**	**T**	**P**	**C**		**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
I Year	CSLM XXX	Core 1	3	0	0	3		CSLM XXX	Core 4	3	0	0	3
	CSBM XXX	Core 2	3	0	2	3		CSBM XXX	Core 5	3	0	2	4
	CSBM XXX	Core 3	3	0	2	4		CSBM XXX	Elective 2	3	0	0	3
	CSLM XXX	Elective 1	3	0	0	3		CSLM XXX	Elective 3	3	0	0	3
	CSLM XXX	MOOC Course	-	-	-	3		CSLM XXX	MOOC Course	-	-	-	3
	CSPM XXX	Core Lab I	-	-	-	4		CSPM XXX	Core Lab II	-	-	-	4
		Total Credits				**20**			**Total Credits**				**20**

	Semester III							IV					
	Course Code	**Course Name**	**L**	**T**	**P**	**C**		**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
II Year	CSPM XXX	Seminar – I	-	-	-	1		CSPM XXX	Major Project	-	-	-	16
	CSLM XXX	MOOC Course	-	-	-	3		CSLM XXX	MOOC Course	-	-	-	3
	CSPM XXX	Minor Project	-	-	-	16		CSPM XXX	Seminar - II	-	-	-	1
	Total Credits					**20**		**Total Credits**					**20**

4.1 Core Courses

S. No	Course Code	Course Name	L	T	P	C
1.	CSLM 501	Computational Mathematics	3	0	0	3
2.	CSLM 554	Statistical Methods for Research	3	0	0	3
3.	CSLM 555	Computer Vision and Pattern recognition	3	0	0	3
4.	CSLM 701	Simulation & Modeling	3	0	0	3
5.	CSLM 702	Reinforcement Modeling	3	0	0	3
6.	CSLM 665	Parallel Algorithms	3	0	0	3
7.	CSLM 703	Introduction to Parallel Programming	3	0	0	3

8.	CSLM 704	Data Analysis with R	3	0	0	3
9.	CSLM 705	Sequence, Time Series and Prediction	3	0	0	3
10.	CSLM 706	Introduction to Concurrent Programming with GPUs	3	0	0	3
11.	CSLM 707	Exploratory Data Analysis for Machine Learning	3	0	0	3
12.	CSLM 708	Computational Thinking for Problem Solving	3	0	0	3
13.	CSLM 709	Discrete Optimization	3	0	0	3
14.	CSLM 710	Precalculus through Data and Modelling Specialization	3	0	0	3
15.	CSLM 711	Large Language Model Operations	3	0	0	3
16.	CSBM 502	Advanced Data Structures and Algorithms	3	0	2	4
17.	CSBM 505	Data Mining and Warehousing	3	0	2	4
18.	CSBM 551	Networking and Communication	3	0	2	4
19.	CSBM 552	Advanced Artificial Intelligence	3	0	2	4

4.2 Elective Courses : Bouquet 1 (Specialization in Artificial Intelligence)

S. No	Course Code	Course Name	L	T	P	C
1.	CSLM 621	Reinforcement Learning and Applications	3	0	0	3
2.	CSLM 622	Information Retrieval	3	0	0	3
3.	CSLM 625	Soft Computing	3	0	0	3
4.	CSLM 751	Social Media Analytics	3	0	0	3
5.	CSLM 752	Game Theory	3	0	0	3
6.	CSLM 753	Optimization Techniques	3	0	0	3
7.	CSLM 754	Data Handling & Visualization	3	0	0	3
8.	CSLM 755	Artificial Intelligence for Robotics	3	0	0	3
9.	CSLM 756	Distributed Databases	3	0	0	3
10.	CSLM 757	Quantum Computing	3	0	0	3
11.	CSLM 758	Sentiment Analysis	3	0	0	3
12.	CSLM 759	Nature inspired Algorithms	3	0	0	3
13.	CSLM 760	Fuzzy Logic and Applications	3	0	0	3
14.	CSLM 761	Multimedia Databases	3	0	0	3

4.3 Elective Courses: Bouquet 2 (Specialization in Data Science

S. No	Course Code	Course Name	L	T	P	C
1.	CSLM 624	Social Network Analysis	3	0	0	3
2.	CSLM 635	Distributed Systems	3	0	0	3
3.	CSLM 636	Time Series Analysis	3	0	0	3
4.	CSLM 752	Game Theory	3	0	0	3
5.	CSLM 754	Data Handling & Visualization	3	0	0	3
6.	CSLM 756	Distributed Databases	3	0	0	3
7.	CSLM 757	Quantum Computing	3	0	0	3
8.	CSLM 762	Cloud Computing	3	0	0	3
9	CSLM 763	Internet of Things	3	0	0	3
10.	CSLM 764	Information Security and Privacy	3	0	0	3
11.	CSLM 765	Big Data Management	3	0	0	3
12.	CSLM 766	Advanced Databases	3	0	0	3
13.	CSLM 767	Multimedia Databases	3	0	0	3
14.	CSLM 768	Health Informatics	3	0	0	3

4.4. Core Lab/Seminar/ Project

S. No	Course Code	Course Name	L	T	P	C
1.	CSPM 801	Seminar – I	-	-	-	1
2.	CSPM 802	Seminar – I	-	-	-	1
3.	CSPM 803	Core Lab I	-	-	-	4
4.	CSPM 804	Core Lab II	-	-	-	4
5.	CSPM 805	Minor Project	-	-	-	16
6.	CSPM 806	Major Project	-	-	-	16