BIRLA INSTITUTE OF TECHNOLOGY

B.Sc. (Artificial Intelligence & Data Science)

CURRICULUM BOOK
BASED ON NATIONAL EDUCATION POLICY 2020 (NEP-2020)

(Effective from Academic Session: 2025-26)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

INSTITUTE VISION

To become a Globally Recognized Academic Institution in consonance with the social, economic and ecological environment, striving continuously for excellence in education, research and technological service to the National needs.

INSTITUTE MISSION

- To educate students at Undergraduate, Postgraduate, Doctoral, and Post-Doctoral levels to perform challenging engineering and managerial jobs in industry.
- To provide excellent research and development facilities to take up Ph.D. programmes and research projects.
- To develop effective teaching learning skills and state of art research potential of the faculty.
- To build national capabilities in technology, education and research in emerging areas.
- To provide excellent technological services to satisfy the requirements of the industry and overall academic needs of society.

DEPARTMENT VISION

The department strives to be recognized globally for outstanding education and research, leading to excellent professionals and innovators in the field of Computer Science and Engineering, who can positively contribute to the society.

DEPARTMENT MISSION

- To impart quality education and equip the students with strong foundation that could make them capable of handling challenges of the new century.

- To maintain state of the art research facilities and facilitate interaction with world's leading universities, industries and research organization for constant improvement in the quality of education and research.

Programme Educational Objectives (PEO)

PEO 1: The program will produce graduates who will be competent professionals in IT industry, academics, government or entrepreneurs.

PEO 2: Graduates will exhibit professional ethics, critical thinking, problem solving and effective communication skills to work collaboratively in a team-based environment.

PEO 3: The graduates will possess leadership qualities and will be capable of attaining higher positions in their professional career.

PEO 4: Graduates will be able to adapt to the fast-changing world of technology and will become effective professionals to address the technical, social and business challenges.

PEO 5: Graduates will recognize the importance of interdisciplinary learning, engage in lifelong learning and professional development.

Programme Outcomes (PO)

1. **Discipline knowledge:** Demonstrate the comprehensive knowledge of mathematics, computing fundamentals and domain concepts to enhance their professional skills.

2. **Problem analysis:** Apply to identify, formulate and analyze solutions to various computing problems using the fundamental principles of computing.

3. **Design/development of solutions:** Ability to design, develop and implement computer-based solutions to real world problems using appropriate tools and techniques.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modem IT tools including prediction and modeling to challenging problems.

6. **The graduates and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the IT professionals

7. **Environment and sustainability:** Understand the impact of the professional computer-based solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles to maintain the integrity in a working environment in sustainable societal development through objective, unbiased and truthful actions.

9. **Individual and team work:** Ability to work effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Express thoughts and ideas effectively in understanding computing activities by writing effective reports, making effective presentations, constructing documentation and presenting complex information in a concise manner.

11. **Project management:** Learn to build a project from pre-implementation to completion within constraints in multidisciplinary environments.

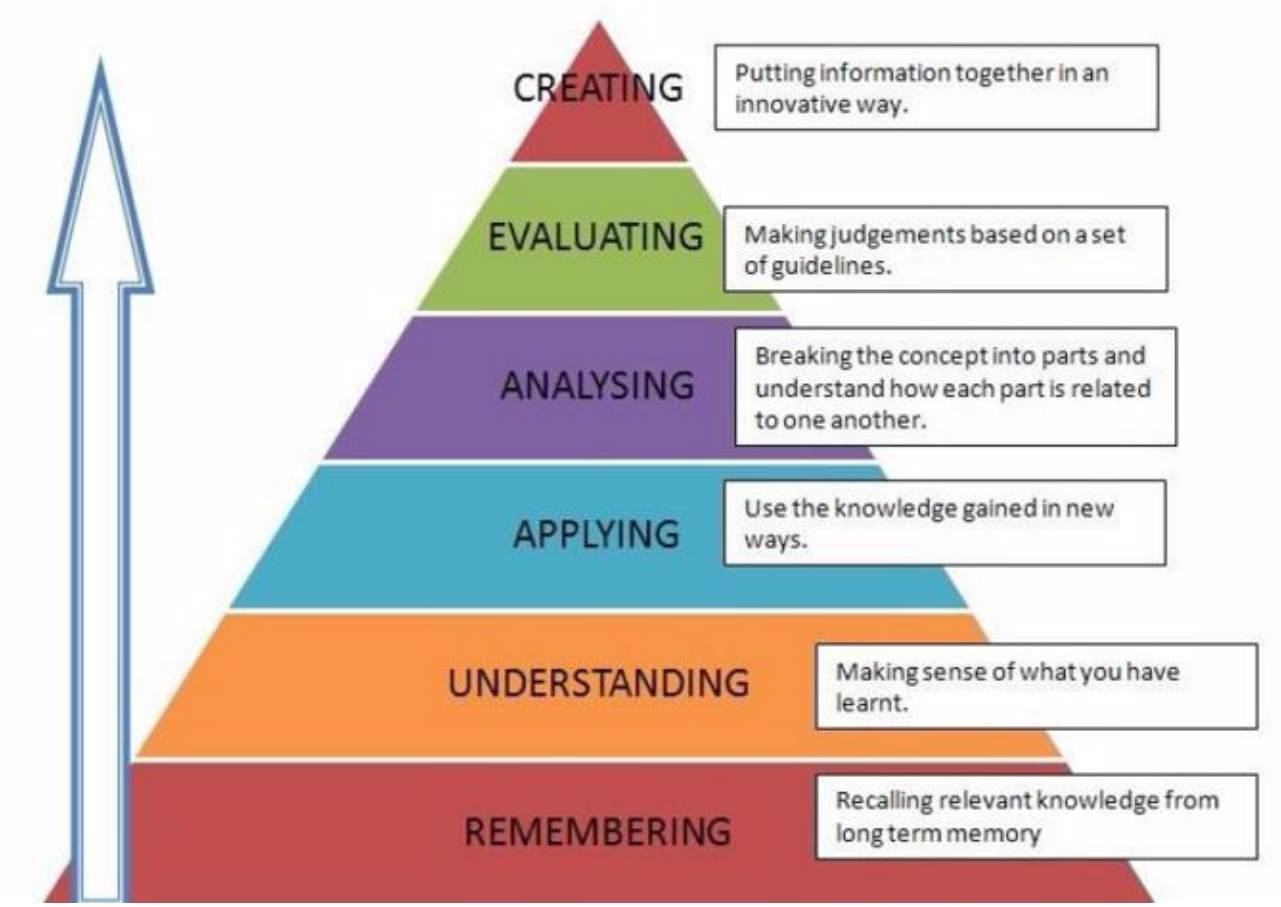
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

1. The ability to analyze, design, code, and test application-specific or complex problems in artificial intelligence, machine learning, big data analytics, cloud computing, and cybersecurity by applying knowledge of basic sciences, mathematics, and computing fundamentals.
2. The ability to adapt to rapid changes in tools and technology with an understanding of societal and ecological issues relevant to professional practice through lifelong learning.
3. Excellent adaptability to function in a multidisciplinary work environment, strong interpersonal skills as a leader in a team, and appreciation of professional ethics and societal responsibilities.

BLOOM'S TAXONOMY FOR CURRICULUM DESIGN AND ASSESSMENT:

Preamble
The design of curriculum and assessment is based on Bloom's Taxonomy. A comprehensive guideline for using Bloom's Taxonomy is given below for reference.



BIRLA INSTITUTE OF TECHNOLOGY-MESRA, RANCHI

COURSE STRUCTURE FOR B.Sc. (Artificial Intelligence & Data Science)
(w.e.f. Academic Session 2025-26)

Semester/ Session of Study (Recommended)	Course Level	Category of Course	Course Code	Courses	Mode of delivery and credits L-Lecture; T-Tutorial; P-Practical			Total Credits C
					L	T	P	C
		THEORY						
First Monsoon	**ONE**	DSC	SC25101	Programming with C	3	0	0	3
		DSC	SC25105	Operating Systems	3	0	0	3
		DSC	SC25107	Fundamentals of Computing	2	0	0	2
		MDC	SC25109	Fundamentals of Mathematics	3	0	0	3
		VAC – Elective		VAC Elective Course - I				2
				VAC Elective Course - II				2
		LABORATORIES						
		DSC	SC25102	C Programming Lab	0	0	3	1.5
		AEC	HS24131	Communication Skills-I	0	0	3	1.5
		SEC-SB Elective		SEC-SB Elective I	0	1	4	3
		TOTAL						**21**

Semester/ Session of Study (Recommended)	Course Level	Category of Course	Course Code	Courses	Mode of delivery and credits L-Lecture; T-Tutorial; P-Practical			Total Credits C
					L	T	P	C
		THEORY						
Second Spring	**ONE**	DSC	SC25113	Introduction to Data Structures	3	1	0	4
		DSC	SC25115	Python Programming	3	0	0	3
		MDC	SC25117	Mathematics for Computing	3	0	0	3
		VAC – Elective		VAC Elective Course - III				2
		LABORATORIES						
		DSC	SC25114	Data Structures Lab	0	0	3	1.5
		DSC	SC25116	Python Programming Lab	0	0	3	1.5
		AEC	HS24133	Communication Skills- II	0	0	3	1.5
		SEC-SB Elective		SEC-SB Elective II	0	1	4	3
		TOTAL						**19.5**

Total credits after I year :40.5

VOCATIONAL COURSES FOR EXIT AFTER 1st Year

Category of Course	Course Code	Courses	L	T	P	C
Vocational Course I	MN25120	Event Management	3	0	0	3
Vocational Course II	CA25133	Fundamentals of Multimedia	3	0	0	3

Semester/ Session of Study (Recommended)	Course Level	Category of Course	Course Code	Courses	Mode of delivery and credits L-Lecture; T-Tutorial; P-Practical			Total Credits C
					L	T	P	C
Third Monsoon	TWO	**THEORY**						
		DSC	SC25201	Data Analytics and Visualization	3	0	0	3
		DSC	SC25203	Database Design Concepts	3	0	0	3
		MDC	SC25205	Mathematics for Artificial Intelligence	3	0	0	3
		MDC	MN25106	Principles of Management	3	0	0	3
		AEC	MN25109	Public speaking and creative writing	1	0	2	2
		SEC-SB		SEC-SB Elective III	2	0	2	3
		LABORATORIES						
		DSC	SC25202	Data Analytics Lab	0	0	3	1.5
		DSC	SC25204	Database Design Lab	0	0	3	1.5
		TOTAL						**20**

Semester/ Session of Study (Recommended)	Course Level	Category of Course	Course Code	Courses	Mode of delivery and credits L-Lecture; T-Tutorial; P-Practical			Total Credits C
					L	T	P	C
Fourth Spring	TWO	**THEORY**						
		DSC	SC25211	Artificial Intelligence and Applications	3	1	0	4
		DSC	SC25213	Data Mining and Applications	3	0	0	3
		DSC	SC25215	Fundamentals of Computer Algorithms	3	1	0	4
		DSE		**DSE I**	3	0	0	3
		AEC	MN25201	Personality Development	3	0	0	3
		LABORATORIES						
		DSC	SC25214	Data Mining Lab	0	0	3	1.5
		DSC	SC25216	Computer Algorithms lab	0	0	3	1.5
		TOTAL						**20**

Total Credits after II year : 40.5.+40=80.5.

VOCATIONAL COURSES FOR EXIT AFTER 2nd Year

Category of Course	Course Code	Courses	L	T	P	C
Vocational Course III	MN25214	Basic of Financial Markets and Equity Research	3	0	0	3
Vocational Course IV	CA25225	Business Intelligence	3	0	0	3

Semester/ Session of Study (Recommended)	Course Level	Category of Course	Course Code	Courses	Mode of delivery and credits L-Lecture; T-Tutorial; P-Practical			Total Credits C
					L	T	P	C
Fifth Monsoon	**THREE**	**THEORY**						
		DSC	SC25301	Software Engineering	3	0	0	3
		DSC	SC25303	Basics of Machine Learning	3	0	0	3
		DSC	SC25305	Deep Learning	3	0	0	3
		DSE		**DSE II**	3	0	0	3
		LABORATORIES						
		DSC	SC25302	Software Engineering Lab	0	0	3	1.5
		DSC	SC25304	Machine Learning Lab	0	0	3	1.5
		DSC	SC25306	Deep Learning Lab	0	0	3	1.5
		Minor Internship/ Project	SC25308	Minor Project-1/ MOOC	0	0	0	3
		TOTAL						**19.5**

Semester/ Session of Study (Recommended)	Course Level	Category of Course	Course Code	Courses	Mode of delivery and credits L-Lecture; T-Tutorial; P-Practical			Total Credits C
					L	T	P	C
Sixth Spring	**THREE**	**THEORY**						
		DSC	SC25315	Generative AI and Applications	3	0	0	3
		DSC	SC25319	Big Data Analytics	3	0	0	3
		DSC	SC25321	Cyber Security	3	0	0	3
		DSE		**DSE III**	3	0	0	3
		LABORATORIES						
		DSC	SC25316	AI Applications Lab	0	0	3	1.5
		DSC	SC25320	Big Data Analytics Lab	0	0	3	1.5
		DSC	SC25330	Project	0	0	0	6
		TOTAL						**21**

Total Credits after III years :40.5+40+40.5=121

Semester/ Session of Study (Recommended)	Course Level	Category of Course	Course Code	Courses	Mode of delivery and credits L-Lecture; T-Tutorial; P-Practical			Total Credits C
					L	T	P	C
Seventh Monsoon	**FOUR**	**THEORY**						
		DSC	SC25401	Blockchain Technology	3	1	0	4
		DSC	SC25405	Research Methodology	3	0	0	3
		DSC	SC25409	Natural Language Processing	3	0	0	3
		DSE		**DSE IV**	3	0	0	3
		DSE		**DSE V**	3	0	0	3
		LABORATORIES						
		DSC	SC25410	NLP Lab	0	0	3	1.5
		DSE		**DSE IV Lab**	0	0	3	1.5
		DSE		**DSE V Lab**	0	0	3	1.5
		TOTAL						**20.5**

Semester/ Session of Study (Recommended)	Course Level	Category of Course	Course Code	Courses	Mode of delivery and credits L-Lecture; T-Tutorial; P-Practical			Total Credits C
					L	T	P	C
Eighth Spring	FOUR	**THEORY**						
		DSC	SC25411	Business & Financial Analytics	3	0	0	3
		DSC		MOOC	3	0	0	3
		LABORATORIES						
		DSC	SC25412	Business & Financial Analytics Lab	0	0	3	1.5
		Research Project/ Dissertation	SC25420	Research project /Internship with Viva-voce and seminar presentation.	0	0	0	12
		TOTAL						**19.5**

Total Credits after IV years:40.5+40+40.5+40=161

(i) After four years **B.Sc. Honours (AI & DS)** will be given or

(ii) Students who secure 7.5 CGPA and above at the end of sixth semester are eligible to undertake research stream in the fourth year and have to complete Research Project/Dissertation (12 Credits) to become eligible for **B.Sc. Honours with Research (AI & DS) degree**

Discipline Specific Elective Courses (DSE)

Discipline Specific Elective Courses (DSE I)					
Course Code		L	T	P	C
SC25217	Computer Networks	3	0	0	3
SC25219	Fuzzy Logic and Applications	3	0	0	3
Discipline Specific Elective Courses (DSE II)					
SC25307	Cloud computing	3	0	0	3
SC25309	System Programming	3	0	0	3
Discipline Specific Elective Courses (DSE III)					
SC25327	Regression Techniques & Time Series Analysis	3	0	0	3
SC25329	Advanced Applications of ML	3	0	0	3
SC25331	Evolutionary Algorithms	3	0	0	3
Discipline Specific Elective Courses (DSE IV)					
SC25427	Internet of Things	3	0	0	3
SC25428	Internet of Things Lab	0	0	3	1.5
SC25415	Full Stack Application Development	3	0	0	3
SC25416	Full Stack Application Development Lab	0	0	3	1.5
Discipline Specific Elective Courses (DSE V)					
SC25421	Computer Vision	3	0	0	3
SC25422	Computer Vision Lab	0	0	3	1.5
SC25423	Cryptography and Network Security	3	0	0	3
SC25424	Cryptography and Network Security Lab.	0	0	3	1.5

Acronyms Expanded

- AEC : Ability Enhancement Course
- DSC : Discipline Specific Core (Course)
- DSE : Discipline Specific Elective (Course)
- VAC : Value Added Course
- SEC-SB : Skill Enhancement Course-Skill Based
- MDC : Multidisciplinary Course

Ability Enhancement Course (AEC)

Course Code	Subject	L	T	P	C
HS24131	Communication Skills-1	0	0	3	1.5
HS24133	Communication Skills-2	0	0	3	1.5
MN25109	Public speaking and creative writing	2	0	0	2
MN25201	Personality Development	3	0	0	3
BF25207	Creative and Critical Thinking Skills	2	1	0	3
BF25213	Effective Writing and Presentation Skills	1	1	0	2
	Total Credits to be Cleared				**8**

Skill Enhancement Course-Skill Based (SEC-SB)

	Course Codey	Subject	L	T	P	C
SEC-SB Elective - I	CA25110	Office Automation Tools	0	1	4	3
	CA25112	Linux administration	0	1	4	3
SEC-SB Elective – II	CA25130	Programming with MatLab	0	1	4	3
	CA25132	Introduction to Latex	0	1	4	3
SEC-SB Elective - III	CA25209	Statistics with R	2	0	2	3
	CA25215	Computer Oriented Numerical Methods	2	0	2	3
		Total Credits to be Cleared				**9**

Value Added Courses (VAC)

Course Code	Subject	L	T	P	C
MN25102	Human Values and Professional Ethics	2	0	0	2
MN25103	YOGA	1	0	2	2
MN25104	Physical Education	1	0	2	2
CA25109	Environmental Science	2	0	0	2
MN25111	Digital Empowerment	2	0	0	2
MN25112	Emotional Intelligence	2	0	0	2
SC25131	Design Thinking	2	0	0	2
	Total Credits to be Cleared				**6**

Multidisciplinary Course (MDC)

Course Code	Subject	L	T	P	C
SC25109	Fundamentals of Mathematics	3	0	0	3
SC25117	Mathematics for Computing	3	0	0	3
SC25205	Mathematics for Artificial Intelligence	3	0	0	3
MN25106	Principles of Management	3	0	0	3