

Thadomal Shahani Engineering College

(A Constituent College of HSNC University, Mumbai)

Bachelor of Engineering (B.E.)
in
Artificial Intelligence & Data Science

Programme Scheme

R-2026

(As per NEP 2020)

Undergraduate Programme

Applicable from Academic Year 2027–28

(Subject to revision after every two academic years)

Thadomal Shahani Engineering College

(A Constituent College of HSNC University, Mumbai)

Institute Vision:

Perpetuating and transcending the processes of:

- Contributing to evolving supply chain of human capital for National Economy
- Creating entrepreneurs and ‘game changers’ to support heightened level of economic activities underpinning ever increasing human aspiration
- Helping the Nation evolve as a total solution provider
- Value and wealth creation for the mankind

Institute Mission:

Focusing and practicing:

- Product and processes innovation
- Leveraging human cognitive and behavioral science for creating instructional content
- Pervasive and ubiquitous Information Communication Technologies for customized content for learning
- Acknowledge and facilitate various learning styles and learning abilities
- Migrating from teaching paradigm to learning paradigm
- Every day discourse shall inculcate research culture and further the cause of societal advancement
- Understand various markets and cultures
- Collaborative learning and emotional integrity
- Sensitizing about opportunities in Energy, Education, Environment and Health care sectors
- Extensively promoting computer aided design, analysis and manufacturing procedures
- Theoretical rigor to develop conceptual clarity
- Modeling and design of experiments to inculcate culture of investigation
- Helping foot print on Project management and collaborative human endeavor
- Interdisciplinary studies and exposure to functional areas

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Department Vision:

Transcending the process of integrating intelligence to Technology Products and Processes by architectural and algorithmic solution building procedures resulting in autonomous entities which shall surpass collective human intelligence.

Department Mission:

- Engage learners to develop competency in algorithmic approaches in resolving complexities of real time problems.
- Help pupils to develop competency in creative and architectural solution building processes for building efficiencies
- Initiate the learners to intuitive / creative solution building processes as a complimentary skill set
- Scaling up the process of creating digital learning content in the realm of AI & DS underpinning the theories of cognitive science and virtual / Augmented reality techniques
- Design and create a supply chain of human capital with high degree of intellectual/ emotional and spiritual quotient to man the evolving National economies
- Equip students with multi-disciplinary skill sets to offer solutions to real time problems through initiating them to the process of research and innovation
- To create an academic environment for higher learning, lifelong learning, academic excellence, and research endeavours
- Design ways and means of initiating learners to acquire high level of mathematical integrity and analytical competency
- Training the learners to develop emotional integrity, interpersonal Intelligence, and intrapersonal intelligence to make them evolve as a Human capital for the society at large
- Sensitising learners about sustainable development process, resilience of systems, and desirability of influencing the evolving world order to optimise wealth and value creation for the mankind

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Program Specific Outcomes (PSOs)

- PSO1: The ability to conceptualise, formulate, design, analyse and create solutions underpinning the knowledge of human cognition, Digital-Computational technologies, Artificial Intelligence and Data Science in terms of real-world problems to contribute to sustainable progress of mankind at large
- PSO2: The ability to apply knowledge of basic science, probability & statistics, computational algorithms to carryout research to contribute the body of knowledge in the realm of computer science/ engineering and Artificial Intelligence & Data Science.

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Program Outcome (POs)

- PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
- PO2: Problem Analysis: Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
- PO3: Design / Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
- PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
- PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).
- PO6: The Engineer and the World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
- PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
- PO8: Individual and Collaborative Team Work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
- PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
- PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Structure for Artificial Intelligence & Data Science

HSNC University, Mumbai

Second Year (with effect from A.Y 2027-28)

SEMESTER III

Course Code	Course Title	Teaching Scheme (Contact Hours)			Credit	EVALUATION SCHEME							
		L	T	P		IA-I	IA-II	IA-I + IA II	End Sem Exam	Exam duration in hrs.	Term Work	Practical & Oral Exam	Total
PC301	Probability and Statistics	2	--	--	2	20	20	40	60	2	--	--	100
PC302	Discrete Mathematics and Graph Intelligence	3	--	--	3	20	20	40	60	2	--	--	100
PC303	Data Structures and Algorithms	3	--	--	3	20	20	40	60	2	--	--	100
PC304	Database Management Systems and NoSQL	3	--	--	3	20	20	40	60	2	--	--	100
OE301	Open Elective: To be taken from the bucket provided	2#	--	--	2	10	10	20	30	1	--	--	50
PCL301	Data Structures and Algorithms Lab	--	--	2	1	--	--	--	--	--	25	25	50
PCL302	Database Management Systems and NoSQL Lab	--	--	2	1	--	--	--	--	--	25	25	50
VSE301	Object-Oriented Programming with Python	--	--	2+2*	2	--	--	--	--	--	50	25	75
CEP301	Mini Project- 1A	--	--	4 ^s	2	--	--	--	--	--	25	25	50
EEM301	Operations Management (Syllabus common to all Branches)	--	--	2*+2	2	--	--	--	--	--	50	--	50
TOTAL		13	--	16	21	90	90	180	270	9	175	100	725

* Two hours of practical class to be conducted for full class as demo/discussion.

\$ indicates workload of Learner (Not Faculty), Students can form groups with minimum 2 (Two) and not more than 4 (Four), Faculty Load: 1 hour per week per four groups

#Institute shall offer an Open Elective course from the Science/Commerce/Management stream basket provided by HSNC University.

Program Structure for Artificial Intelligence & Data Science

HSNC University, Mumbai

Second Year (with effect from A.Y 2027-28)

SEMESTER IV

Course Code	Course Title	Teaching Scheme (Contact Hours)			Credit	EVALUATION SCHEME							
		L	T	P		IA-I	IA-II	IA-I + IA II	End Sem Exam	Exam duration in hrs.	Term Work	Practical & Oral Exam	Total
PC401	Machine Learning	3	--	--	3	20	20	40	60	2	--	--	100
PC402	Enterprise Knowledge & Business Intelligence	3	--	--	3	20	20	40	60	2	--	--	100
PC403	Operating System	3	--	--	3	20	20	40	60	2	--	--	100
MD401	Multi-Disciplinary Minor: Behavioural Economics	3	--	--	3	20	20	40	60	2	--	--	100
OE401	Open Elective: To be taken from the bucket provided	2#	--	--	2	10	10	20	30	1	--	--	50
PCL401	Machine Learning Lab	--	--	2	1	--	--	--	--	--	25	25	50
PCL402	Enterprise Knowledge & Business Intelligence Lab	--	--	2	1	--	--	--	--	--	25	25	50
PCL403	Operating System Lab	--	--	2	1	--	--	--	--	--	25	25	50
MDL401	Multi-Disciplinary Minor: Behavioural Economics Lab	--	--	2	1	--	--	--	--	--	25	25	50
CEP401	Mini Project-1B	--	--	4 ^{\$}	2	--	--	--	--	--	25	25	50
VECL401	Environmental Science for Engineers (Syllabus common to all Branches).	--	--	2*+2	2	--	--	--	--	--	50	--	50
TOTAL		14	--	16	22	90	90	180	270	9	175	125	750

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Program Structure for Artificial Intelligence & Data Science

HSNC University, Mumbai

Third Year (with effect from A.Y 2028-29)

SEMESTER V

Course Code	Course Title	Teaching Scheme (Contact Hours)			Credit	EVALUATION SCHEME							
		L	T	P		IA-I	IA-II	IA-I + IA II	End Sem Exam	Exam duration in hrs.	Term Work	Practical & Oral Exam	Total
PC501	Deep Learning	3	--	--	3	20	20	40	60	2	--	--	100
PC502	Natural Language Processing	3	--	--	3	20	20	40	60	2	--	--	100
PC503	Cloud Computing for AI and Data Science	3	--	--	3	20	20	40	60	2	--	--	100
PE501	Program Electives -I	3	--	--	3	20	20	40	60	2	--	--	100
MD501	Multi-Disciplinary Minor: Financial Accounting	3	--	--	3	20	20	40	60	2	--	--	100
OE501	Open Elective: To be taken from the bucket provided	2#	--	--	2	10	10	20	30	1	--	--	50
PCL501	Deep Learning Lab	--	--	2	1	--	--	--	--	--	25	25	50
PCL502	Natural Language Processing Lab	--	--	2	1	--	--	--	--	--	25	25	50
PCL503	Cloud Computing for AI and Data Science Lab	--	--	2	1	--	--	--	--	--	25	25	50
PEL501	Program Electives -I Lab	--	--	2	1	--	--	--	--	--	25	25	50
MDL502	Multi-Disciplinary Minor: Financial Accounting Lab	--	--	2	1	--	--	--	--	--	25	25	50
CEP501	Mini Project- 2A	--	--	4 ^{\$}	2	--	--	--	--	--	25	25	50
TOTAL		17	--	14	24	110	110	220	330	11	150	150	850

PE501	Program Electives -I	PEC5011 Computer Network PEC5012 Cybersecurity & Threat Intelligence PEC5013 Computer Vision	PEL5011 Computer Network Lab PEL5012 Cybersecurity & Threat Intelligence Lab PEL5013 Computer Vision Lab
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Program Structure for Artificial Intelligence & Data Science

HSNC University, Mumbai

Third Year (with effect from A.Y 2028-29)

SEMESTER VI

Course Code	Course Title	Teaching Scheme (Contact Hours)			Credit	EVALUATION SCHEME							
		L	T	P		IA-I	IA-II	IA-I + IA II	End Sem Exam	Exam duration in hrs.	Term Work	Practical & Oral Exam	Total
PC601	Intelligent Drones and Moving Robotics	3	--	--	3	20	20	40	60	2	--	--	100
PC602	Generative AI and Large Language Models	3	--	--	3	20	20	40	60	2	--	--	100
PE601	Program Electives -II	3	--	--	3	20	20	40	60	2	--	--	100
PE602	Program Electives -III	3	--	--	3	20	20	40	60	2	--	--	100
MD601	Multi-Disciplinary Minor: UPI and Fintech	3	--	--	3	20	20	40	60	2	--	--	100
PCL601	Intelligent Drones and Moving Robotics Lab	--	--	2	1	--	--	--	--	--	25	25	50
PCL602	Generative AI and Large Language Models Lab	--	--	2	1	--	--	--	--	--	25	25	50
PEL601	Program Electives -II Lab	--	--	2	1	--	--	--	--	--	25	25	50
PEL602	Program Electives -III Lab	--	--	2	1	--	--	--	--	--	25	25	50
MDL601	Multi-Disciplinary Minor: UPI and Fintech Lab	--	--	2	1	--	--	--	--	--	25	25	50
VSE601	Multimodal Gen AI for Marketing	--	--	2*+2	2	--	--	--	--	--	50	--	50
CEP601	Mini Project-2B	--	--	4 ^{\$}	2	--	--	--	--	--	25	25	50
TOTAL		15	--	18	24	100	100	200	300	10	200	150	850

PE601	Program Electives -II	PEC6011 MLOps and Model Deployment PEC6012 Nature-Inspired Optimization Algorithms PEC6013 Middleware for building intelligence into legacy system	PEL6011 MLOps and Model Deployment Lab PEL6012 Nature-Inspired Optimization Algorithms Lab PEL6013 Middleware for building intelligence into legacy system Lab
PE602	Program Electives -III	PEC6021 Blockchain Technology & Cryptocurrency PEC6022 Data Engineering and Pipelines PEC6023 Sustainability & ESG Practices	PEL6021 Blockchain Technology & Cryptocurrency Lab PEL6022 Data Engineering and Pipelines Lab PEL6023 Sustainability & ESG Practices Lab

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Program Structure for Artificial Intelligence & Data Science

HSNC University, Mumbai

Fourth Year (with effect from A.Y 2029-30)

SEMESTER VII

Course Code	Course Title	Teaching Scheme (Contact Hours)			Credit	EVALUATION SCHEME							
		L	T	P		IA-I	IA-II	IA-I + IA II	End Sem Exam	Exam duration in hrs.	Term Work	Practical & Oral Exam	Total
PC701	Agentic AI Systems and Applications/Online Course through MOOC's Platform	3	--	--	3	20	20	40	60	2	--	--	100
PE701	Program Electives -IV	3	--	--	3	20	20	40	60	2	--	--	100
PCL701	Agentic AI Systems and Applications//Online Course through MOOC's Platform Lab	--	--	2	1	--	--	--	--	--	25	25	50
PEL701	Program Electives -IV Lab	--	--	2	1	--	--	--	--	--	25	25	50
MDL701	Multi-Disciplinary Minor: Banking and Insurance Lab	--	--	2*+2	2	--	--	--	--	--	50	25	75
PC701	Major Project- I	--	--	4	2	--	--	--	--	--	50	50	100
EL702	Internship	(Entire Semester)			6	--	--	--	--	--	100	100	200
TOTAL		06	--	12	18	40	40	80	120	04	250	200	675

PE701	Program Electives -IV	PEC7011 Affective Computing and Swarm Intelligence PEC7012 AI in Deployment Strategies PEC7013 Edge Computing	PEL7011 Affective Computing and Swarm Intelligence Lab PEL7012 AI in Deployment Strategies Lab PEL7013 Edge Computing Lab
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* Two hours of practical class to be conducted for full class as demo/discussion

Program Structure for Artificial Intelligence & Data Science

HSNC University, Mumbai

Fourth Year (with effect from A.Y 2029-30)

SEMESTER VIII

Course Code	Course Title	Teaching Scheme (Contact Hours)			Credit	EVALUATION SCHEME							
		L	T	P		IA-I	IA-II	IA-I + IA II	End Sem Exam	Exam duration in hrs.	Term Work	Practical & Oral Exam	Total
PC801	AI in Product Development and Entrepreneurship/Online Course through MOOC's Platform	3	--	--	3	20	20	40	60	2	--	--	100
PE801	Program Electives-V	3	--	--	3	20	20	40	60	2	--	--	100
PCL801	AI in Product Development and Entrepreneurship//Online Course through MOOC's Platform Lab	--	--	2	1	--	--	--	--	--	25	25	50
PEL801	Program Electives -V Lab	--	--	2	1	--	--	--	--	--	25	25	50
PC801	Major Project- II	--	--	4	2	--	--	--	--	--	50	50	100
EL802	Internship	(Entire Semester)			6	--	--	--	--	--	100	100	200
TOTAL		06	--	08	16	40	40	80	120	04	200	200	600

PE801	Program Electives -V	PEC8011 Quantum Computing PEC8012 AI enabled Project Management practices PEC8013 AI for Space Mission	PEL8011 Quantum Computing Lab PEL8012 AI enabled Project Management practices Lab PEL8013 AI for Space Mission Lab
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Program Structure for Artificial Intelligence & Data Science
HSNC University, Mumbai
List of Multidisciplinary Minor

Sr. No	Subject	Semester
1	Behavioural Economics	IV
2	Financial Accounting	V
3	UPI and Fintech	VI
4	Banking and Insurance	VII

Program Structure for Artificial Intelligence & Data Science
HSNC University, Mumbai
Open Elective Bucket

Sr. No	Subject
1	Evolution of Science and Technology
2	Global Supply Chain Management
3	International Treaties and Agreements
4	International Relations
5	COP (Conference Of Parties)
6	Global South & their Aspirations
7	Ways and Means of Reducing Digital Illiteracy
8	Private Sector Opportunities in Space & Nuclear Technology
9	Introduction to Social Science
10	Introduction to Anthropology
11	UN Sustainability Goals