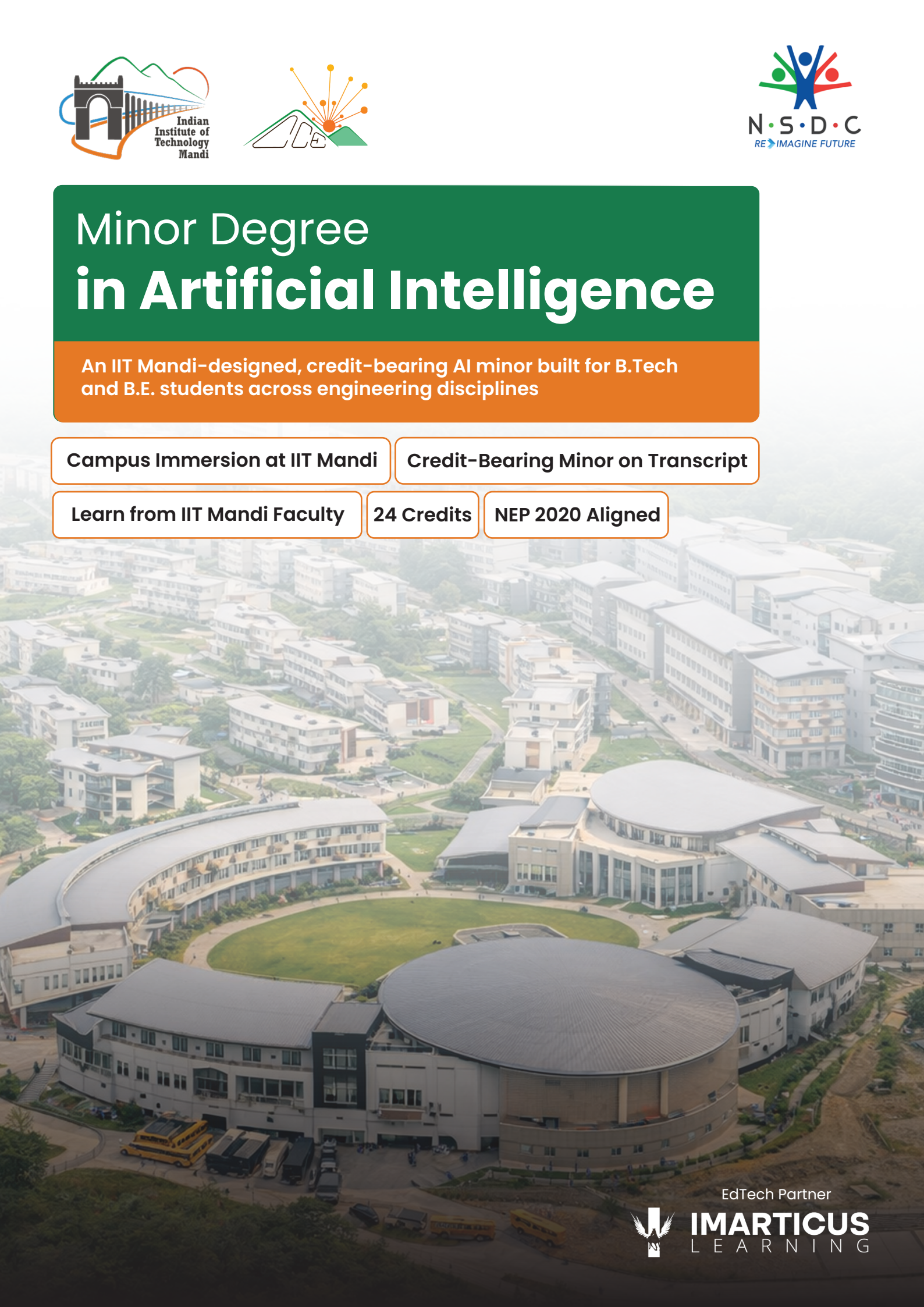
Indian Institute of Technology Mandi

N·S·D·C
RE IMAGINE FUTURE

Minor Degree
in Artificial Intelligence

An IIT Mandi-designed, credit-bearing AI minor built for B.Tech and B.E. students across engineering disciplines

- Campus Immersion at IIT Mandi
- Credit-Bearing Minor on Transcript
- Learn from IIT Mandi Faculty
- 24 Credits
- NEP 2020 Aligned



EdTech Partner
IMARTICUS LEARNING

Why Institutions
Need an AI Minor Now

AI is reshaping engineering across software, automation, manufacturing, analytics, robotics, and intelligent systems.

For today's engineering students, AI is no longer optional, it is becoming a must-have skill for future-ready careers

Future-Relevant Skills

Equip engineering students with AI, machine learning, and data-driven problem-solving skills.

Better Shortlisting Potential

Help students stand out for emerging engineering and technology roles.

Stronger Academic Differentiation

Position your institution as forward-looking with industry-relevant AI learning.

Career-Ready Engineers

Build practical exposure aligned with evolving recruiter expectations.

Aligned with the Future of Engineering

Prepare students for an engineering landscape shaped by intelligent systems and automation.

What Recruiters Expect from **Today's Engineering Graduates**

Today's campus recruiters do not just want engineers. They want engineers who can think with data, build with AI, and deploy intelligent systems from day one

The roles they are actively hiring:

- AI Engineer
- ML Engineer
- Data Scientist
- GenAI Developer
- AI Product Developer

The skills they are screening for at every campus drive:

- Machine learning pipelines
- NLP. Generative AI
- Computer vision
- LLM-based application development

The gap between an engineering graduate and an AI-ready engineering graduate is exactly what this program closes.

The Challenges Institutions Face **in Launching AI Education**

Most engineering institutions want to offer AI education. Very few have what it takes to do it well

Limited Availability of AI Faculty

AI education requires expertise in machine learning, deep learning, data, and computational foundations.

Curriculum Design Complexity

AI curriculam evolve rapidly and requires continuous academic updating.

Infrastructure and Research Exposure

Many institutions do not have access to advanced AI academic environments.

Academic Credibility

Students and parents increasingly value program associated with premier institutions.

How This Program Helps Institutions **Meet Evolving Recruiter Expectations**

The IIT Mandi Minor Degree in Artificial Intelligence helps institutions close a critical gap in engineering education by integrating structured, credit-based AI learning into the undergraduate curriculum

IIT Academic Leadership	Industry-Relevant AI Curriculum	Structured 6-Semester Learning Path	Faculty Engagement
Curriculum designed and academically anchored by IIT Mandi experts.	Covers AI, ML, Deep Learning, GenAI, and deployment.	Builds capability from AI foundations to advanced applications.	Selected sessions delivered by IIT Mandi faculty and experts.

Institutional Advantages **of Offering the IIT Mandi AI Minor**

A future-ready academic addition that delivers measurable institutional impact

Elevate Institutional Brand
Associate your engineering program with IIT Mandi's academic authority in AI. Strengthen your institution's positioning as a forward-looking campus offering credit-bearing AI education.

Improve Student Employability
Graduates leave with a dual credential, an engineering degree and an IIT-certified AI specialisation, making them directly competitive for aspiring roles in AI engineering.

Strengthen Placement Outcomes
AI-skilled engineering graduates attract stronger recruiter interest, higher offer rates, and significantly better average CTCs across every hiring vertical from software to manufacturing to analytics.

NEP 2020 Compliance
The 24-credit Minor Degree structure meets UGC multidisciplinary framework requirements, supporting your institution's academic reform goals and accreditation positioning.

Future-Proof Your Academic Portfolio
Institutions that embed structured AI engineering education today lead on NAAC assessments and student admissions tomorrow.

Why Leading Engineering Institutions **Choose IIT Mandi's AI Minor Program?**

The only IIT-designed AI curriculum built specifically for engineering undergraduates

IIT Mandi Designed Curriculum

From AI Fundamentals to Generative AI Systems, engineering students learn AI the way IIT students learn it. Rigorous, structured, and built for the real-world curriculum, solving with large language models and RAG architectures.

Zero Disruption Integration

No new departments. No timetable overhaul. The program integrates cleanly within every B.Tech and B.E. curriculum, semester by semester, credit by credit.

Industry-Standard Tooling

Students build real AI systems using Python, Scikit-learn, deep learning frameworks, GenAI APIs, and Power BI. Every semester ends with a working project, not just an exam.

IIT Faculty Access

Selected sessions delivered by IIT Mandi faculty give your students direct exposure to the research culture and academic rigour of a premier national institution.

Campus Immersion

Students can visit IIT Mandi, engage with live AI research, attend faculty sessions, and experience a world-class research-driven engineering institution firsthand.

The Minor Degree in **Artificial Intelligence by IIT Mandi**

A comprehensive 24-credits academic framework enabling engineering institutions to offer structured, credit-bearing AI education

Semester	Subject	Credits
1	Python Programming: Foundations to AI Libraries	4
2	Mathematics & Statistics for AI	4
3	Data Engineering & Visualization	3
4	Machine Learning Fundamentals	4
5	Deep Learning, Computer Vision & NLP	4
6	Generative AI & Large Language Models	3
7	AI / GenAI Capstone Project	2

24 Credits.
7 Semesters.

The AI
Engineering Curriculum

One IIT-Designed Pathway Built for Engineers

Semester 1: Python Programming: Foundations to AI Libraries

4 Credits | 5 Modules

Module 1: Python Fundamentals
Builds core Python skills covering syntax, control flow, functions, and the standard library.

Module 2: Data Structures & OOP
Covers lists, dictionaries, file I/O, exception handling, and object-oriented programming.

Module 3: Scientific Computing with NumPy & Pandas
Introduces array operations, vectorized computation, and DataFrame-based data manipulation.

Module 4: Data Visualization with Matplotlib & Seaborn
Teaches chart creation, multi-plot layouts, and designing visuals for reporting.

Module 5: Scikit-learn & AI Library Ecosystem
Introduces the Scikit-learn API and provides an overview of the broader AI/ML library landscape.

Lab: Python scripting, NumPy operations, Pandas data cleaning, Matplotlib/Seaborn dashboard, end-of-semester project: data ingestion to insight.

Outcome: Write modular Python programs using OOP; manipulate datasets with NumPy and Pandas; produce publication-quality visualizations; use Scikit-learn for preprocessing; organise AI workflows in Jupyter Notebooks.

Semester 2: Mathematics & Statistics for AI

4 Credits | 5 Modules

Module 1: Linear Algebra for AI
Builds mathematical foundations in vectors, matrices, eigenvalues, and matrix operations used in AI models.

Module 2: Calculus & Optimisation
Covers derivatives, gradients, chain rule, and optimisation methods including gradient descent.

Module 3: Probability Theory
Strengthens understanding of probability, distributions, expectation, variance, and Bayes' theorem.

Module 4: Statistical Inference
Covers hypothesis testing, confidence intervals, and statistical decision-making for AI.

Module 5: Information Theory & Applications
Introduces entropy, mutual information, and their applications in AI and machine learning.

Lab: Matrix operations in NumPy, gradient descent implementation, probability simulations, statistical tests on real datasets, and an end-of-semester mathematical modeling project.

Outcome: Apply linear algebra to AI model computations; implement optimisation algorithms from scratch; reason statistically about data; use probability theory in AI decision-making.

Semester 3: Data Engineering & Visualization

3 Credits | 5 Modules

Module 1: Data Foundations for AI
Introduces data structures, preprocessing pipelines, and AI-ready dataset preparation for analytics.

Module 2: SQL for AI & Analytics
Covers SQL queries, joins, aggregations, and structured data retrieval for AI and data workflows.

Module 3: Data Wrangling & Feature Engineering
Develops skills in data cleaning, transformation, and feature construction for AI models.

Module 4: Data Visualisation for AI Insights
Develops skill in data visualisation, dashboards, and insight communication for AI-led analysis.

Module 5: Big Data Concepts & Pipelines
Introduces distributed data processing concepts, ETL pipelines, and scalable data architectures.

Lab: SQL queries on real datasets, visualisation using Matplotlib and Seaborn, dashboard creation using Power BI, end-to-semester data pipeline mini-project.

Outcome: Strong foundation in data engineering, SQL, feature engineering, and visualisation for AI. Build reproducible data pipelines and communicate insights effectively.

Semester 4: Machine Learning Fundamentals

4 Credits | 5 Modules

Module 1: Introduction to Machine Learning
Establishes ML problem formulation, the supervised/unsupervised distinction, and the end-to-end ML workflow.

Module 2: Regression Methods
Covers linear, polynomial, and logistic regression with Ridge, Lasso, and ElasticNet regularisation.

Module 3: Classification Algorithms
Introduces kNN, decision trees, random forests, SVMs, and Naive Bayes with practical use cases.

Module 4: Clustering & Dimensionality Reduction
Covers k-Means, hierarchical clustering, PCA in practice, and t-SNE for visualisation.

Module 5: Model Evaluation & Selection
Teaches cross-validation, evaluation metrics, hyperparameter tuning, and model interpretability.

Lab: Regression modelling end-to-end; classification pipeline; customer segmentation project; hyperparameter tuning lab; model evaluation report; mini-project: predictive analytics system.

Outcome: Formulate ML problems and select algorithms; train and compare models rigorously; apply regularisation and feature engineering; interpret model outputs; build end-to-end ML pipelines with Scikit-learn.

Semester 5: Deep Learning, Computer Vision & NLP

4 Credits | 4 Modules

Module 1: Neural Network Foundations
Covers MLP architecture, activation functions, forward pass, backpropagation derivation, and optimisers.

Module 2: Training Deep Networks
Addresses weight initialisation, batch normalisation, dropout, learning rate schedules, and debugging.

Module 3: Computer Vision with CNNs
Introduces convolution, pooling, CNN architectures (ResNet), transfer learning, and image augmentation.

Module 4: Natural Language Processing
Covers text preprocessing, word embeddings, RNN/LSTM/GRU sequence models, and attention intuition.

Lab: MLP from scratch in NumPy; CNN image classification in PyTorch; transfer learning project; NLP pipeline; sentiment analysis; integrative project: image or text AI system.

Outcome: Implement neural network training from first principles; build and fine-tune CNN models; develop NLP pipelines; apply transfer learning to constrained datasets; debug deep learning performance.

Semester 6: Generative AI & Large Language Models

3 Credits | 5 Modules

Module 1: Foundations of Generative AI
Introduces autoencoders, VAEs, GANs, and content generation concepts in modern AI.

Module 2: Transformers in AI
Covers attention mechanisms, self-attention, and transformer architecture powering today's AI systems.

Module 3: Large Language Models
Explains LLMs, pretraining, fine-tuning, RLHF, and real-world Generative AI applications.

Module 4: Retrieval-Augmented Generation (RAG)
Focuses on RAG pipelines, vector databases, and knowledge retrieval systems for enterprise AI use cases.

Module 5: Responsible AI
Covers bias, hallucination, ethics, governance, and trustworthy AI deployment practices.

Lab: Transformer-based AI application build, LLM fine-tuning exercise using GenAI APIs, RAG-based AI assistant development, responsible AI audit.

Outcome: Strong grounding in Generative AI, LLMs, transformer architecture, RAG systems, and Responsible AI. Build and deploy enterprise-grade GenAI applications.

Semester 7: AI / GenAI Capstone Project

2 Credits | 4 Modules

Module 1: Project Definition & Data Pipeline
Scopes the problem, identifies datasets, and builds a reproducible end-to-end data pipeline.

Module 2: Model Design & Development
Implements and iterates on an AI model with ablation studies and rigorous evaluation.

Module 3: Evaluation & Reporting
Produces a final IEEE-format report with results analysis and stakeholder-ready outputs.

Module 4: Presentation & Defence
Demonstrates the project and defends technical decisions before a faculty and industry panel.

Lab: Week 1-2: problem definition. Week 3-4: data pipeline. Week 5-6: baseline model. Week 7-8: model improvement. Week 9: final report. Week 10: demonstration and oral presentation.

Outcome: Design and implement a complete end-to-end AI system; conduct independent technical research; document projects to professional standards; present and defend AI solutions to a technical audience.

AI & Data Tools
Engineers Master

Integrated tools training that supports applied learning across the AI engineering curriculum

python™ | matplotlib | scikit learn | seaborn | jupyter

MySQL | Power BI | GitHub | Claude | ChatGPT

Skills
That Shape AI-Ready Engineers

Practical, career-relevant skills developed through an AI-first engineering curriculum

- AI problem-solving
- Data analysis and preprocessing
- Data visualization and dashboarding
- SQL-based data querying
- Machine Learning model building
- Computer Vision applications
- Model evaluation and validation
- Deep Learning fundamentals
- Generative AI and RAG implementation
- NLP workflow development

Exclusive
IIT Mandi Student Privileges

From official access credentials to curated program goodies, students become part of a more premium and differentiated learning journey

Official CCE, IIT Mandi Student Email ID

Students will have @cce.iitmandi.ac.in. email address. The same identity every IIT Mandi student carries. CCE Fellow Status (only upon successful completion/passing of each course in Minor) may also be added as a privilege.

CCE, IIT Mandi Identity Card

An official IIT Mandi student card that recognises you as part of one of India's most respected engineering institutions. Carry it to the campus immersion. Carry it with pride.

Who Stands
Behind This Program?

IIT-level academic rigour. Government-backed national reach. One unified program

Indian Institute of Technology Mandi

IIT Mandi stands among India's most respected institutes of national importance, with strong academic and research capabilities in AI, Machine Learning, Data Science, and Intelligent Systems.

Curriculum Architecture: Every module is designed, structured, and owned by IIT Mandi.

Faculty Engagement: Students learn directly from IIT Mandi faculty through selected academic sessions.

Academic Oversight: Program standards and pedagogical quality are maintained by IIT Mandi across all six semesters.

The Credential: A Minor Degree from IIT Mandi on your official transcript. Not a certificate. Not a badge.

Indian Institute of Technology Mandi

N·S·D·C
RE IMAGINE FUTURE

National Skill Development Corporation

NSDC brings the infrastructure, institutional reach, and operational capability to deliver this program across colleges nationwide.

Institutional Partnerships: Outreach, onboarding, and partner college coordination at a national scale.

Program Delivery: End-to-end operational support so institutions deliver consistently, without building internal capacity.

Quality Assurance: Standardised benchmarks applied across every partner institution in the network.

National Scale: Built to reach thousands of students across hundreds of institutions simultaneously.

IIT Mandi builds the academic standard. NSDC delivers it at scale. Your students get both.

About **IIT Mandi**

Established in 2009, IIT Mandi is one of India's leading IITs with strong research and academic programs in Artificial Intelligence and Intelligent Systems

Key strengths include:

- Research in AI, Machine Learning, and Data Science
- Interdisciplinary academic ecosystem
- Strong innovation and startup culture
- National academic credibility

Through this program, partner institutions benefit from IIT Mandi's academic leadership in AI education.

About CCE, IIT Mandi

The Centre for Continuing Education (CCE) was established in early 2022 at IIT Mandi to dedicatedly cater for the national requirement for skilling, up-skilling, and re-skilling of individuals from various Govt./Semi Govt. organizations, public and private undertakings, research institutions and industries.

- Programmes for learners from elementary schools to working professionals worldwide
- Logistics and administrative support for academic outreach activities
- Conferences, Workshops, Symposia, Short-term courses, and Training programs

A variety of continuing education programmes have been organized fulfilling the needs for nation-building at all levels, so that learners around the globe can gain knowledge and develop professional growth skill sets. All institute academic outreach activities are executed under the umbrella of the CCE.

Regulatory
& Academic Alignment

Academically credible. Institutionally recognised. Built to comply

NEP 2020 Compliant

The 24-credits, 7-semester AI Minor fits directly within the NEP 2020 framework for multidisciplinary undergraduate program. Engineering students build a formal AI specialisation without altering their primary degree.

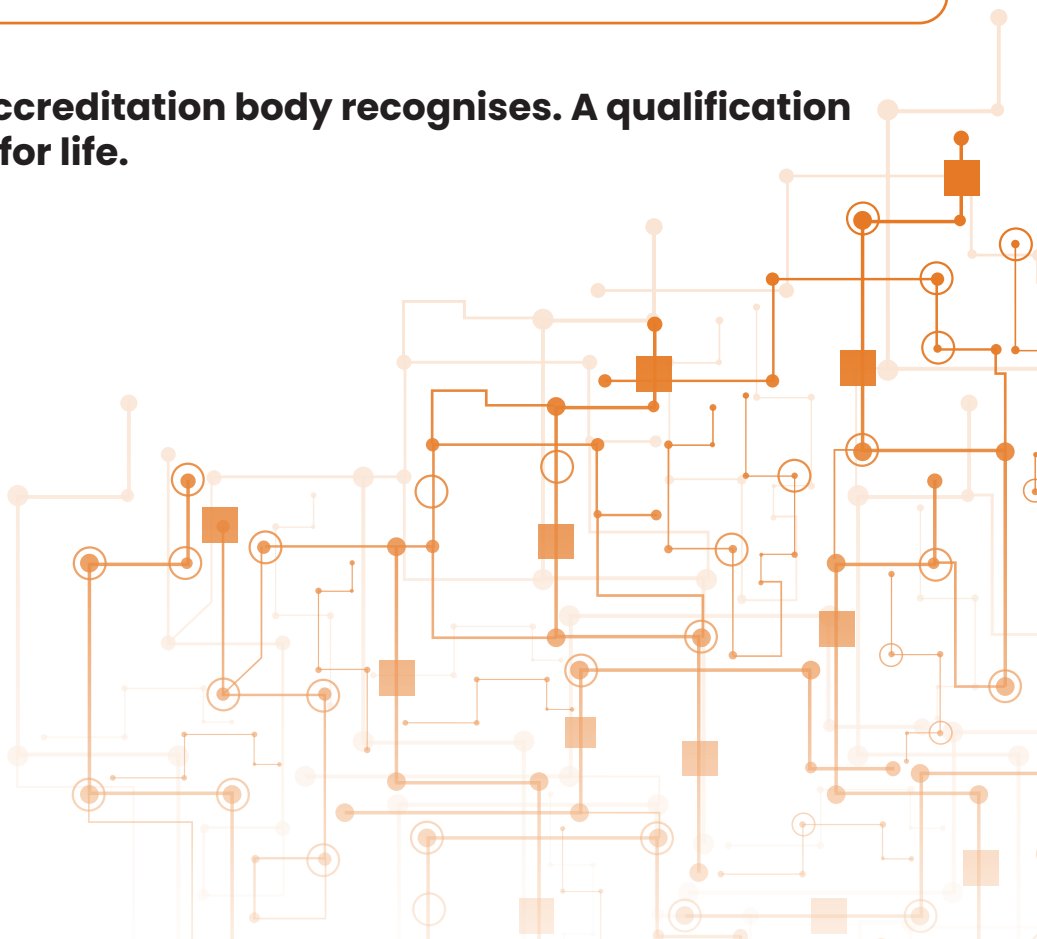
UGC Guidelines

This is not a certificate. Not a badge. The Minor Degree in Artificial Intelligence is recorded on the student's official academic transcript, fully consistent with UGC undergraduate specialisation guidelines.

Institute of National Importance

IIT Mandi is established under the Institutes of Technology Act of Parliament. The AI engineering curriculum, faculty oversight, and Minor Degree credential carry the same institutional standing as every IIT in India.

A credential that your accreditation body recognises. A qualification your students will carry for life.



Taught by
IIT Mandi's Finest AI Minds

Learn directly from IIT Mandi's AI and Machine Learning faculty alongside industry experts who build intelligent systems for a living

Manoj Thakur

Professor, IIT Mandi

Prof. Manoj Thakur brings over 19 years of experience across academia and the financial domain, with expertise in Soft Computing, Machine Learning, Computational Finance, and AI-driven analytical systems. As a Professor at IIT Mandi, he has played a key role in advancing interdisciplinary learning and industry-oriented education through teaching, research, and academic leadership.

His teaching spans Python Programming, Data Science & AI, Machine Learning for Business, Probability & Statistics, and Computational Financial Modelling. He has also been recognised with the IIT Mandi Director's Award for Excellence in Teaching for his outstanding contribution to academic innovation and learner engagement.

The IIT Mandi
and NSDC Perspective on this Program

"At IIT Mandi, we strongly believe that Artificial Intelligence is no longer a niche discipline — it is becoming a foundational capability across industries and domains. As technology continues to reshape how systems are built and decisions are made, it is critical that students are exposed to AI in a structured, rigorous, and application-oriented manner early in their academic journey.

This Minor Degree program has been designed to bring together academic depth, practical learning, and emerging areas like Generative AI, ensuring that students graduate with both strong fundamentals and the ability to build real-world AI solutions."

- Prof. Tushar Jain
Head CCE, IIT Mandi

"At NSDC, we see Artificial Intelligence as a key enabler of India's future workforce and economic growth. As AI-driven technologies continue to transform industries, there is an urgent need to develop deep technical talent that combines strong academic grounding with industry relevance.

Our collaboration with IIT Mandi on the skilling pathways in Artificial Intelligence underscores a shared commitment to nurturing future-ready professionals who are not only proficient in advanced AI technologies, but also equipped to apply them responsibly to real-world challenges across sectors."

Mr. Nitin Kapoor
Vice President, NSDC Academy

Admission
& Enrolment

Straightforward. Merit-based. Open to all engineering branches.

Who
Can Enrol

B.Tech and B.E. students across all branches. Enrolment opens in Year 1 of your undergraduate program.

How
Selection Works

Profile Evaluation

Academic background and discipline confirmation

Fee Payment

Online program fee payment

Program Enrolment

Confirmation, onboarding, and program induction

Program **Fees**

₹70,000
(inclusive of all taxes)

Partner with IIT Mandi to Build the Next Generation of AI-Ready Engineers

IIT Mandi Affiliation | NEP 2020 Aligned | Zero Infrastructure Burden

Schedule Discussion