

# M.Tech in Industrial AI

## from

# IIT Madras

### Technical Brochure

**February 23, 2023**

## **About IIT-M**

The Indian Institute of Technology Madras (IIT Madras) was established as an autonomous Institute of national importance in 1959 by the Government of India with initial technical and financial support from the Government of Germany. IIT Madras is well equipped with teaching laboratories, advanced research facilities, sophisticated services, and computing and networking capabilities. IIT Madras has been ranked as the 'Best Educational Institution' in the country under the National Institutional Rankings Framework (NIRF) ranking number 1 and as the 'Top innovative Institution' in the country under the Atal Ranking of Institutions on Innovation Achievements (ARIIA). Its synchrony with the IITM research park and the ecosystem for startups has entailed top spots in higher technical education, research, and industrial consultancy. IIT Madras conducts academic programs of B.Tech., Dual Degree (B.Tech. and M.Tech.) Dual Degree (B.S. & M.S.), M.B.A., M.Tech., M.Sc. Integrated M.A., M.S., and Ph.D. in various Disciplines.

## **Minimum Eligibility**

- B.Tech/B.E. (4 years) in any branch with mathematics as compulsory subject in 10+2+3 system. Or
- M.Sc.: M.Sc. + B.Sc. (Maths / IT / Statistics / computing and with mathematics as compulsory subject in 10+2+3 system)

## **About the programme**

This is a part time online Master of Technology (M. Tech.) programme specialization in Industrial Artificial Intelligence that will have credits and recognition equivalent to a full time M. Tech. programme of IIT Madras. Upon successful completion of the Program (Courses, Assessments, Lab work and Project works) IIT M shall issue M. Tech. degree with credits.

## **Tenure:**

- 20 months – Part time (Online)

## **Commitment:**

- 27 hrs / week for the entire duration of 20 months
- Willing to do programming.
- Willing to work in Industrial AI projects

### Program Overview

SL #	Course Type	No of courses	No of Credits	Course Names
1	Core Courses	6	63	1. Mathematical Foundations for Data Science 2. Applied Time series analysis 3. Multivariate Data Analysis 4. Machine Learning and its applications 5. Applied Deep Learning 6. Online and Reinforcement Learning
2	Electives (Specialization)	2	20	1. Elective 1- AI in Predictive Maintenance, Reliability and Warranty (AND) 2. Elective 2 – AI in Process & Logistic Optimization (OR) 3. Elective 3 – Industrial Vision AI (Corrosion detection & classification, Defect detection & classification)
3	Laboratory	2	12	1. Lab 1 – Industrial AI Laboratory 2. Lab 2 – Industrial AI at Scale Laboratory – ML/DL/DRL at Cloud AI platform
4	Project Work	3	95 [Project 1 (25) + Project 2 (35) + Project 3 (35)]	1. Project 1 in Term 4 2. Project 2 in Term 5 3. Project 3 in Term 6
	TOTAL	<b>13</b>	<b>190</b>	

### **Course Credits**

SL#	Course Name	Course Type	Code	Credits	Term
1	Mathematical Foundations for Data Science	Core	CH5019	12	1
2	Applied Time Series Analysis	Core	CH5350	9	1
3	Multivariate Data Analysis	Core	CH5440	9	1
4	Machine Learning and its applications	Core	ID5001W	9	2
5	Applied Deep Learning	Core	ID6001W	12	2
6	Industrial AI at Scale Laboratory	Lab	ID5003W	6	2
7	Online and Reinforcement Learning	Core	ID6002W	12	3
8	Industrial AI Laboratory	Lab	ID5002W	6	3
9	AI in Predictive Maintenance, Reliability and Warranty	Elective	ID5004W	10	3
10	AI in Process & Logistic Optimization	Elective	ID6003W	10	3
11	Industrial Vision AI	Elective	ID6004W	10	4

## Course Syllabi

SL#	Course Name	Code	Course Contents
1	Mathematical Foundations for Data Science	CH5019	Basics of Data Science, Linear Algebra for Data Science, Probability, Statistics and Random Processes for Data Science, Optimization for Data Science
2	Applied Time Series Analysis	CH5350	Introduction to Time Series – Analysis, Partial Auto-Correlation Function, Power Spectrum, Basics and Design of filters for data cleaning and pre-processing, Kalman filter, Applications to process data
3	Multivariate Data Analysis	CH5440	Introduction to multivariate data analytics, Dimensionality reduction, Multivariate regression, Principal Component Analysis, Kernel Principal Components, Generalized Principal Component Analysis, Nonnegative Matrix Factorization
4	Machine Learning and its applications	ID5001W	Introduction to Machine Learning, Function Approximation and Classification Problems, Clustering techniques Lasso and Elastic net, Support vector machines, Decision trees and Random forests
5	Applied Deep Learning	ID6001W	Neural networks basics, Autoencoders, Layer-wise learning, Deep networks, Convolution neural networks, recurrent neural networks, advanced learning Algorithms
6	Industrial AI at Scale Laboratory	ID5003W	ML/DI/DRL at cloud AI platform, Azure ML / Amazon Sagemaker / Google AI / Intel Image AI - any one platform, Pyspark / Python
7	Online and Reinforcement Learning	ID6002W	Introduction to reinforcement learning, Value functions and Q-learning, SARSA, RL with function approximation, Exploration/exploitation, Batch reinforcement learning
8	Industrial AI Laboratory	ID5002W	ML/DL and Python, Hands-on training in data analysis algorithms using python library
9	AI in Predictive Maintenance, Reliability and Warranty	ID5004W	Predictive Maintenance, Failure detection and diagnosis, Forecasting and Recommendations, Reliability and Warranty
10	AI in Process & Logistic Optimization	ID6003W	Mfg. process optimization / Logistics Optimization System Eng 1D / FEM model based / Hybrid Model, Digital Twins, Supply chain management, Smart city, Process improvement and Multivariable optimization control
11	Industrial Vision AI	ID6004W	Corrosion detection & classification / Detection of defect and classification ML and DL in computer vision problem, Graphical models, Image pre-processing, multi-view geometry and models for vision, Computer vision for Retail Stores related (Slip and trip of people, Self-checkout, loss in retail stores, Smart docks etc),

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