

Advanced Diploma in Artificial Intelligence (Certified AI Application Engineer)

Preamble:

Intelligent machines have replaced human capabilities in many areas. Artificial intelligence is the intelligence exhibited by machines or software. It is the branch of computer science that emphasizes on creating intelligent machines that work and react like humans. Artificial Intelligence spans a wide variety of topics in computer science research, including machine learning, deep learning, reinforcement learning, natural language processing, reasoning, perception etc.

Objective:

The course is designed to make the participants capable of solving industry standard problems in artificial intelligence. After completing the course, the participants will be capable of doing the following.

- They will be able to formulate the right AI problems that can be solved with the raw data available.
- They will be able to apply various machine learning algorithms on structured data to develop machine learning models and compare them to obtain the most suitable model and by using suitable metrics.
- They will be able to develop suitable machine learning models using unstructured data using various machine learning algorithms including deep learning, natural language processing methods, computer vision and reinforcement learning.

Expected Job Roles:

- AI Engineer
- AI Research Scientist
- Data Engineer
- Software Engineer

Duration:

420 Hours - (Theory: 140 hrs + Practical: 175 hrs+ Project: 105hrs)

Course Outline:

Sl. No	Module Title	Duration (Hours)		
		Theory	Lab	Total
1	Introduction to AI and Programming Tools	52	68	120
2	Machine Learning	30	40	70
3	Deep Learning and Natural Language Processing	38	52	90
4	AI Platforms & Reinforcement Learning	20	15	35
5	Project	10	95	105
	Total Duration	150	270	420
	Total Credits	10	9	19

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Prerequisites:

Having good computer programming knowledge

Eligibility:

- a) BE/B.Tech/BSc (IT/Computer Science/Electronics), BCA, 3 year Diploma (IT/Computer Science/Electronics), Degree holders with PGDCA, DOEACC A, B level Or equivalent of any of these.
- b) Candidates who have appeared in the qualifying examination and awaiting results.

Detailed Syllabus and Learning Outcome:

S. No	Module Title	Topics	Duration (Hours)		Learning Outcome
			Theory	Lab	
1	Module-1 Introduction to AI and Programming Tools	1.0 Linux basics 1.1 Python Basics Data Types, Conditional Statements, Looping, Control Statements, String, List And Dictionary Manipulations, Python Functions, Modules And Packages, Object Oriented Programming in Python, Regular Expressions, Exception Handling, Popular python packages like pandas for data handling 1.2 Introduction to Database Management System & SQL, Database Interaction in Python. 1.3 Data Analysis & visualization – using numpy, matplotlib, scipy 1.4 R Programming:- Basics - Vectors, Factors, Lists, Matrices, Arrays, Data Frames, Reading data. 1.5 Data visualization - barplot,	52	68	After completion of this module, the candidate will be able to : <ul style="list-style-type: none"> • Operate in Linux OS environment. • Design and write python applications. • Learn basics of database management systems and write python programs to interact with DBMS. • Write python programs to do data analysis and visualization using various libraries • Write R programs and use its various data structures for data analysis, Do data visualization using R. • Solve problems involving probability and do statistical data analysis using statistics and probability distribution methods.

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		<p>pie, scatterplot, histogram, scatter matrix</p> <p>1.6 Probability and Statistics- Probability, Mean, Median, SD, Variance, Probability distributions in R- Normal distribution, Poisson distribution, Binomial distribution. Correlation and Regression.</p>			
2	Module 2- Machine Learning	<p>2.0 Structured and unstructured data handling</p> <p>2.1 Data Preprocessing</p> <p>2.1.1 Handling missing data</p> <p>2.1.2 Data Standardization</p> <p>2.1.2 Label Encoding</p> <p>2.1.3 One hot encoding</p> <p>2.2 Supervised and Unsupervised Learning</p> <p>2.3 Classification, Regression & Clustering</p> <p>2.4 Linear Algebra</p> <p>2.5 Machine Learning Algorithms</p> <p>2.5.1 Linear Regression</p> <p>2.5.2 KNN</p> <p>2.5.3 K Means</p> <p>2.5.4 Logistic Regression</p> <p>2.5.5 Support Vector Machine</p> <p>2.5.6 Decision Tree</p> <p>2.5.7 Naïve Bayes, etc.</p> <p>2.6 Ensemble Methods - Random Forest, Boosting and Optimization, etc.</p> <p>2.7 Model Evaluation Metrics</p>	30	40	<p>After learning this module the participant will be able to</p> <ul style="list-style-type: none"> grab raw data, clean it and make it ready for building machine learning models Identify the suitable task to be performed on data for useful model development Apply suitable algorithm on the data to develop models <p>Use suitable metrics to come up with the most suitable model for solving a particular task</p>
3.	Module -3 Deep Learning and Natural	<p>3.0 Deep Learning Concepts</p> <p>3.1 Artificial Neural Network</p> <p>3.2 Deep Neural Networks</p> <p>3.2.1 Convolutional Neural</p>	38	52	<p>After completion of this module the participants will be able to</p> <ul style="list-style-type: none"> Solve AI problems

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	Language Processing	<p>Network</p> <p>3.2.2 Recurrent Neural Network</p> <p>3.2.3 OpenCV, Tensorflow, Keras</p> <p>3.2.4 Introduction to Generative Adversarial Networks(GAN)</p> <p>3.3 Natural Language Processing Methods</p> <p>3.3.1 Basics of text processing</p> <p>3.3.2 Lexical processing</p> <p>3.3.3 Syntax and Semantics</p> <p>3.3.4 Parts of Speech Tagging</p> <p>3.3.5 Applications like Sentiment Analysis, Text Classification, Text Summarization, Document Clustering, Document Similarity, Web Crawling etc.</p>			<p>involving unstructured data.</p> <ul style="list-style-type: none"> • Implement solutions for image related problems using Deep Learning • Implement solutions to text related problems using NLP
4.	Module-4 AI Platforms & Reinforcement Learning	<p>4.0 Introduction to AI/Cognitive platforms</p> <p>4.1 Reinforcement Learning and its applications in AI</p>	15	20	<p>After attending this module the participants will be able to</p> <ul style="list-style-type: none"> • use popular AI platforms to solve AI based problems • use reinforcement learning to solve AI related problems
5.	Module-5 Project	<p>5.0 The participants will be doing an industry relevant project using real data.</p>	10	95	<p>After completion of the project</p> <ul style="list-style-type: none"> • Participants will be able to formulate the right problems that can be solved using the data available at hand. • Design the solution • Implement it using

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					latest AI tools and methods.
Total Hours = 420			145	275	

Examination & Certification:

NIELIT's NSQF Examination pattern will be followed for Examination & Certification.

Sl No	Examination Pattern	Modules Covered	Duration in Minutes	Maximum Marks
1	Theory Paper – 1	1,4	90	100
2	Theory Paper – 2	2,3	90	100
3	Practical -1	1-4	180	90
4	Internal Assessment	1-4	-	50
5	Project/Presentation /Assignment	5	-	60
6	Major Project/Dissertation	5	-	100
	Total			500

Note:

1. Pass percentage would be 50% marks in each component, with aggregate pass percentage of 50% and above.
2. Grading will be as under:

Grade	S	A	B	C	D
Marks Range (in %)	$\geq 85\%$	$\geq 75\%$ - $< 85\%$	$\geq 65\%$ - $< 75\%$	$\geq 55\%$ - $< 65\%$	$\geq 50\%$ - $< 55\%$

3. Theory examination would be conducted online and the paper comprise of MCQ and each question will carry 1 mark.
4. Practical examination/Internal Assessment/ Project/Presentation/Assignment would be evaluated internally.
5. Major Project/Dissertation would be evaluated preferably by External / Subject Expert including NIELIT Officials.
6. Candidate may apply for re-examination within the validity of registration.
7. The examinations would be conducted in English Language only.

Recommended hardware/software tools:

1. High end Servers and client machines
2. GPU/TPU

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- Linux based Software infrastructure including python and packages like Scikit-learn, Keras, Tensor Flow, etc.

Faculty & Support / Lab Instructor:

- Two Faculties with B.Tech (CS/IT/EC) / MCA or equivalent with programming knowledge and relevant experience in Artificial Intelligence
- One Support / Lab Instructor with at least Diploma in (CS/IT/EC)/ BCA or equivalent with programming knowledge and relevant experience in Artificial Intelligence

References:

- Machine Learning an algorithmic Perspective by Stephen Marshland
- Programming in Python by Mark Summerfield
- Learning Python By Mark Lutz, David Ascher
- Introduction to Machine Learning with python by Andreas C Muller, Sarah Guido,
- Artificial Intelligence- Reshaping Life and Business by Prabhath Kumar
- R for everyone by Jared P Lander
- <https://scikit-learn.org/>
- <https://www.tensorflow.org/>
- <https://keras.io/>

Course Name	Advanced Diploma in Artificial Intelligence (Certified AI Application Engineer)	Vertical	Artificial Intelligence
Course Code		Rev No	R4
Prepared By	Vimala Mathew	Proposed NSQF Level	7
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