

Government of Pakistan

National Vocational and Technical Training Commission

**Prime Minister Hunarmand Pakistan Program,
"Skills for All"**



Course Contents/ Lesson Plan

Course Title: AI (Artificial Intelligence)

Duration: 6 Months

Trainer Name	
Course Title	AI (Artificial Intelligence)
Objective of Course	<p>The objectives of AI research are reasoning, knowledge representation, planning, learning, natural language processing, realization, and ability to move and manipulate objects. There are long-term goals in the general intelligence sector.</p> <p>Approaches include statistical methods, computational intelligence, and traditional coding AI. During the AI research related to search and mathematical optimization, artificial neural networks and methods based on statistics, probability, and economics, we use many tools. Computer science attracts AI in the field of science, mathematics, psychology, linguistics, philosophy and so on</p> <ol style="list-style-type: none"> 1) Explain the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence 2) Assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving particular engineering problems 3) Develop intelligent systems by assembling solutions to concrete computational problems 4) Understand the role of knowledge representation, problem solving, and learning in intelligent-system engineering. 5) Develop an interest in the field sufficient to take more advanced subjects 6. To have an appreciation for and understanding of both the achievements of AI and the theory underlying those achievements. To have an appreciation for the engineering issues underlying the design of AI systems. 7. To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language. 8. To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs. 9. To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning.

Learning Outcome of the Course	Upon successful completion of this course student will: <ul style="list-style-type: none"> • Be able to design a knowledge based system, • Be familiar with terminology used in this topical area, • Have read and analyzed important historical and current trends addressing artificial intelligence. • Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations. • Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. • Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models. • Demonstrate proficiency developing applications in an 'AI language', expert system shell, or datamining tool. • Demonstrate proficiency in applying scientific method to models of machine learning. • Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications.
Course Execution Plan	<p>Total Duration of Course: 6 Months (26 Weeks)</p> <hr/> <p>Class Hours: 4 Hours per day</p> <hr/> <p>Theory: 20% Practical: 80%</p> <hr/> <p>Weekly Hours: 20 Hours Per week</p> <hr/> <p>Total Contact Hours: 520 Hours</p>
Companies Offering Jobs in the respective trade	<ol style="list-style-type: none"> 1. Freelancing 2. Fiverr 3. Government Institutes 4. Software Houses 5. Crossover 6. All Private Institutes who are developing software <p>https://www.sensetime.com/</p> <p>https://www.en.cloudminds.com/</p> <p>https://www.clare.ai/</p> <p>https://www.yitutech.com/en/</p> <p>http://videoji.com/?lng=en</p>

	https://www.malong.com/en/ https://en.horizon.ai/ http://www.intellif.com/ https://www.yimian.io/ https://www.codejunkie.co/ https://10pearls.com/ https://datumbrian.com/ http://www.liqteq.com/
Job Opportunities	<p>In recent years, careers in artificial intelligence (AI) have grown exponentially to meet the demands of digitally transformed industries. While there are plenty of jobs in artificial intelligence, there's a significant shortage of top tech talent with the necessary skills.</p> <p>According to the job site Indeed, the demand for AI skills has more than doubled over the past three years, and the number of job postings is up by 119 percent. However, job-seeker interest in artificial intelligence careers seems to have leveled off. This suggests that employers are going to struggle to fill these positions for many years.</p> <ul style="list-style-type: none"> • Intelligence Designer • Data Curator • Data Evangelist • Machine Learning Data Scientist • Robotics Process Analyst • Digital Knowledge Manager • AI Interaction Designer • Cognitive Copywriter
No of Students	25
Learning Place	Classroom / Lab
Instructional Resources	<p>Development Platforms:</p> <p>https://www.predictiveanalyticstoday.com/tensorflow/ https://www.predictiveanalyticstoday.com/google-cloud-prediction-api/ https://www.predictiveanalyticstoday.com/microsoft-azure-machine-learning/ https://www.predictiveanalyticstoday.com/rainbird/ https://www.predictiveanalyticstoday.com/infosys-mana/ https://www.predictiveanalyticstoday.com/wipro-holmes/ https://www.predictiveanalyticstoday.com/api-ai/ https://www.predictiveanalyticstoday.com/meya/ https://www.predictiveanalyticstoday.com/kai/ https://www.predictiveanalyticstoday.com/vital-a-i/</p>

<https://www.predictiveanalyticstoday.com/receptiviti/>
<https://www.predictiveanalyticstoday.com/wit/>
<https://www.predictiveanalyticstoday.com/watson-studio/>
<https://www.predictiveanalyticstoday.com/lumiata/>
<https://www.predictiveanalyticstoday.com/infrd/>

Learning Materials:

- Open-air
- The a16z AI Playbook
- Artificial Intelligence Blog
- Machine Learning Mastery
- The Algorithmic Blog
- AI Trends
- CT vision
- Machine Learnings

Scheduled Week	Module Title	Learning Units	Remarks
Week 1	Introduction	Basic Concept of Artificial Intelligence (AI)	
		The Necessity of Learning AI	
		Types of Intelligence	
		branches of AI	
		What is Intelligence Composed Of?	
		What's Involved in AI	
		Application of AI	
		Agent & Environment, Installing Python for AI and Basics of Python	
Week 2	Machine Learning	Types of Machine Learning (ML)	
		Supervised machine learning algorithms	
		Unsupervised machine learning algorithms	
		Logistic Regression, Decision Tree, Support Vector Machine (SVM) K-Nearest Neighbors(KNN)	
		K-Mean Clustering	
		Types of Machine Learning (ML) and Random Forest	
Week 3	Classifiers	Gender Classification (Project)	
		Preprocessing the Data	
		Techniques for Data Preprocessing	
		Labeling Data	
		Create, Read, Write Files in Python	
Week 4	External Libraries	Steps for Building a Classifier in Python (Project)	
		Import Scikit-learn	
		Import Scikit-learn's dataset	
		Organizing data into sets	
		Import libraries in Python, Numpy, Matplotlib etc.	
Week 5	NLTK	AI with Python – Natural Language Processing	
		Components of NLP	
		NLP Terminology	
		lemmatize	
		sentiment analyzer	
		stemmer	
		text chunk	
Tokenizer			
Project			
Week 6	Speech Recognition	AI with Python – Speech Recognition	
		Building a Speech Recognizer	
		Visualizing Audio Signals - Reading from a File	

		and Working on it	
		Characterizing the Audio Signal: Transforming to Frequency Domain	
		Generating Monotone Audio Signal and Feature Extraction from Speech	
		Recognition of Spoken Words (Project)	
Week 7	Searching Algorithms	AI with Python – Gaming	
		Search Algorithms	
		Combinational Search	
		Minimax Algorithm	
		Alpha-Beta Pruning	
Week 8	ChatBOT	Building Bots to Play Games	
		A Bot to Play Last Coin Standing	
		Project Creating Bot	
Week 9	Image Processing	Introduction to Open CV	
		Image Processing	
		Image Input and Output	
		Video Input and Output	
		Project	
Week 10	Object Detection	Object Detection (objdetect module)	
		Cascade Classifier	
		Cascade Classifier Training	
Week 11	Tensor Flow	TensorFlow	
		Installing TensorFlow	
		Loading And Exploring The Data	
		Tasks and Project	
Week 12	Neural Networks	Neural Network With Project	
Week 13	Bayesian Networks	Bayesian Networks with Project	
Week 14	Genetic Algorithms	Genetic Algorithms with Project	
Week 15	Mid-Term Assignment/Exam		
Week 16	Handwritten OCR	Handwritten Digit Classification (Project) apply and collect results	
		Libraries required	
		absl-py==0.7.0	
		astor==0.7.1	
		editdistance==0.5.2	
		gast==0.2.2	

		grpcio==1.18.0 h5py==2.9.0 Keras-Applications==1.0.7 Keras-Preprocessing==1.0.8 Markdown==3.0.1 numpy==1.16.1 opencv-python==4.0.0.21 protobuf==3.6.1 six==1.12.0 tensorboard==1.12.2 tensorflow==1.12.0 termcolor==1.1.0 Werkzeug==0.14.1	
Week 17	Use Classifiers for Prediction	Building meaningful machine learning models for disease prediction.	
Week 18	Recommendation System	A Recommended Systems for Movies and different Tasks concerned to recommendation	
Week 19	Project	Classification of Plant Disease (Project) and different tasks	
Week 20	Drone Camera Project	Real Time Object Detection On Drone Video Streams 1. Drone 2. Laptop/Computer	
Week 21	Employable Project/Assignment (6 weeks i.e. 21-26) in addition of regular classes. OR On job training (2 weeks)	<ul style="list-style-type: none"> ● Guidelines to the Trainees for selection of students employable project like final year project (FYP) ● Assign Independent project to each Trainee ● A project based on trainee's aptitude and acquired skills. ● Designed by keeping in view the emerging trends in the local market as well as across the globe. ● The project idea may be based on Entrepreneur. ● Leading to the successful employment. ● The duration of the project will be 6 weeks ● Ideas may be generated via different sites such as: https://1000projects.org/ https://nevonprojects.com/ 	

		<p>https://www.freestudentprojects.com/ https://technofizi.net/best-computer-science-and-engineering-cse-project-topics-ideas-for-students/</p> <ul style="list-style-type: none"> • Final viva/assessment will be conducted on project assignments. • At the end of session the project will be presented in skills competition • The skill competition will be conducted on zonal, regional and National level. • The project will be presented in front of Industrialists for commercialization • The best business idea will be placed in NAVTTC business incubation center for commercialization. <p>-----</p> <p style="text-align: center;">OR</p> <p>On job training for 2 weeks:</p> <ul style="list-style-type: none"> • Aims to provide 2 weeks industrial training to the Trainees as part of overall training program • Ideal for the manufacturing trades • As an alternate to the projects that involve expensive equipment • Focuses on increasing Trainee’s motivation, productivity, efficiency and quick learning approach. 	
Week 22	Facial Expression Recognition	Recognition of Facial Expressions under Varying Conditions	
Week 23	OCR with Tesseract	Optical Character Recognition (OCR) using Tesseract	
Week 24	Project	Classification of Flowers.	
Week 25	Deep Learning	<p>Deep Learning Project in Python</p> <p>Python 2 or 3 installed and configured. SciPy (including NumPy) installed and configured. Keras and a backend (Theano or TensorFlow) installed and configured.</p>	
Week 26	Entrepreneurship and Final Assessment in	<ul style="list-style-type: none"> • Job Market Searching • Self-employment • Freelancing sites 	

	project	<ul style="list-style-type: none"> • Introduction • Fundamentals of Business Development • Entrepreneurship • Startup Funding • Business Incubation and Acceleration • Business Value Statement • Business Model Canvas • Sales and Marketing Strategies • How to Reach Customers and Engage CxOs • Stakeholders Power Grid • RACI Model, SWOT Analysis, PEST Analysis • SMART Objectives • OKRs • Cost Management (OPEX, CAPEX, ROCE etc.) • Final Assessment 	
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List of Machinery / Equipment

Sr. No	Name of item as per curriculum	Quantity physically available at the training location
1	Computers Minimum Corei5 <ul style="list-style-type: none"> • LCD Display 17" with built in speakers 	25
2	Computer systems with Python IDE 3.7 or latest Installed	25
3	DSL Internet Connection (Minimum 1 MB)	Available on every PC
4	Accessories/Devices <ul style="list-style-type: none"> • Web Cam • drone camera • Multimedia • Audio/visual aid • White Board • Flip Chart Board • Hard copy of Training Material 	
5	UPS	Available

6	Generator / Solar Backup	Available
7	Air Conditioner (2 Tons)	Available

1. Software List

Sr. No	Software Name
1.	Python 3.7.2 or Latest
2.	PyCharm IDE
3.	Anaconda
4.	<ul style="list-style-type: none"> • TensorFlow. • Scikit-Learn. • Numpy. • Keras. • PyTorch. • LightGBM. • Eli5. • SciPy.

2. Minimum Qualification of Teachers / Instructor

The qualification of teachers / instructor of this course should be minimum of Masters in Computer science with minimum 3 years of development experience in relevant trade.

- Masters of Computer Sciences

3. Supportive Notes

Teaching Learning Material

Books Name	Author
Python code for Artificial Intelligence: Foundations of Computational Agents	David L. Poole and Alan K. Mackworth
Artificial Intelligence – A Modern Approach (3rd Edition)	Stuart Russell and Peter

	Norvig
Artificial Intelligence by Example	Denis Rothman
https://www.tutorialspoint.com/artificial_intelligence_with_python/index.htm	
https://becominghuman.ai/mastering-ai-programming-with-python-in-1-year-3d0926e6a2bc	
https://hackr.io/tutorials/learn-artificial-intelligence-ai	