

Government of Pakistan

National Vocational and Technical Training Commission

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



Course Contents/ Lesson Plan

Course Title: Advance Python Programming & Applications

Duration: 6 Months

Trainer Name	
Course Title	Advance Python Programming & Applications
Objective of Course	<p>Employable skills and hands on practice for Python Programming & its Applications</p> <p>According to the latest TIOBE Programming Community Index (a software quality company), Python is one of the top 10 popular programming languages of 2017. Python is a general purpose and high-level programming language. You can use Python for developing desktop GUI applications, websites and web applications. Also, Python, as a high-level programming language, allows you to focus on core functionality of the application by taking care of common programming tasks. The simple syntax rules of the programming language further make it easier for you to keep the code base readable and application maintainable.</p> <p>The objective of the course is to train the person in such a way so that he/she may be able to learn and understand the advanced technologies and terminologies of python as well as develop tools/software in this domain.</p>
Course Execution Plan	<p>Total Duration of Course: 6 Months (26 Weeks)</p> <p>Class Hours: 4 Hours per day</p> <p>Theory: 20% Practical: 80%</p> <p>Weekly Hours: 20 Hours Per week</p> <p>Total Contact Hours: 520 Hours</p>

Learning Outcome of the Course	<p>By the end of this course, the trainees should gain the following competencies:</p> <ul style="list-style-type: none"> • Understanding of programming techniques • Design and structure of web-based applications • Design and coding skills • Integration with API'S • Problems Solving Skills • Latest Machine learning techniques • Latest Data science techniques • Python Expertise
Companies Offering Jobs in the respective trade	<ol style="list-style-type: none"> 1. Upwork 2. Freelancing 3. Fiverr 4. Government Institutes 5. Software Houses 6. Crossover 7. All Private Institutes who are managing software
Job Opportunities	<p>Python has been one of the top languages for the last 2-3 years. All over the world there is a high demand in the Python. Industry needs python developers in various fields such as mobile application developer, web developer, Machine learning, Data Science. Nowadays you will find machine Learning everything. This has created new opportunities for all to earn big and make a career out of this field. With the help of this course, we will be able to give technical training of Information Technology to our youth. There are also opportunities for start-up entrepreneurship due to the high demand in the market in following designated jobs;</p> <ul style="list-style-type: none"> • Software Engineers • Web Developers • Network Administrator • IT Support Officer • Manager / Assistant Manager IT • Machine Learning • Data scientist • Lecturer • Security Analysts • Freelancer
No of Students	

Learning Place	Labs
Instructional Resources	Development Platform: <ul style="list-style-type: none">● https://github.com● https://colab.research.google.com● www.codeskulptor.org● www.repl.it Learning Material: <ul style="list-style-type: none">● https://github.com● https://docs.python.org● https://w3schools.com● https://tutorialspoint.com● https://simpleisbetterthancomplex.com● https://www.geeksforgeeks.org

Scheduled Week	Module Title	Learning Units	Remarks
Week 1/26	Introduction to Python & Development Env	<ul style="list-style-type: none"> ● Motivational Lecture ● Course Introduction ● Success stories ● Job market ● Course Applications ● Institute/work ethics ● Python Introduction <ul style="list-style-type: none"> ○ Created by ○ Created date ○ Why this is famous ○ Famous applications of websites built in this ○ Different Versions & Minor differences ● Python Installation (3.7+ version) ● Setting up Anaconda <ul style="list-style-type: none"> ○ PIP (Module Installations) ○ Virtual Env ● Python IDEs or Text Editors <ul style="list-style-type: none"> ○ Jupyter Notebooks ○ Pycharm Community Edition ○ Spider 	
Week 2/26	Introduction to Python Basic Programming	<p>Basic programming Concept</p> <ul style="list-style-type: none"> ● Basic Syntax (No Semicolon, indentation, No parenthesis) ● Pep8 ● Keywords ● Variables & Literals ● Starting out with Expressions ● Basic Types ● Working with variables ● Arithmetic Operators <ul style="list-style-type: none"> ○ Unary ○ Binary ○ +, -, x, /, //, %, ** ● Percentage example ● Ratio example ● More Examples of simple calculations ● Operators precedence ● Variables type conversion/casting ● Introduction to Data Structures <ul style="list-style-type: none"> ○ List 	

		<ul style="list-style-type: none"> ○ Dictionary ○ Tuple ○ Sets 	
Week 3/26	Introduction to Debugging & User Interactions & Strings	<p>Debugging</p> <ul style="list-style-type: none"> ● Syntax Errors ● Runtime Errors ● Semantic Errors ● How to locate and resolve errors <p>Interactions:</p> <ul style="list-style-type: none"> ● Output/Print (Constants, variables) ● Input <p>Introduction to Strings:</p> <ul style="list-style-type: none"> ● Input ● Output ● Concat 	
Week 4/26	Advance Strings	<p>Introduction to Functions (Just Introduction)</p> <ul style="list-style-type: none"> ● Syntax ● Calling methods ● arguments ● return ● How they works <p>Formatting</p> <ul style="list-style-type: none"> ● Types <p>Mutation</p> <p>Methods</p> <ul style="list-style-type: none"> ● Upper ● Isupper ● Lower ● Islower ● Count ● Strip ● Replace ● Join ● Split ● Substring ● Index ● Negative index <p>Sample activity/project/assignment</p>	

Week 5/26	List Data type & Methods	<p>Methods</p> <ul style="list-style-type: none"> ● Append ● Pop ● Prepend ● Sort ● Count ● Index (+ve and -ve) ● Insert ● Remove <p>List comprehension Mutation Sample activity/project/assignment</p>	
Week 6/26	Dictionary Data type & Methods	<p>Methods</p> <ul style="list-style-type: none"> ● Keys ● Values ● Items ● Get ● Merging ● Pop ● Clear ● Copy <p>Mutation Dictionary comprehension Sample activity/project/assignment</p>	
Week 7/26	Tuple & Sets	<p>Tuple</p> <ul style="list-style-type: none"> ● Definition ● Builtin Methods ● Mutation <p>Sets</p> <ul style="list-style-type: none"> ● Definition ● Builtin Methods ● Frozen Sets ● Mutation 	
Week 8/26	Flow Control	<p>Conditions</p> <ul style="list-style-type: none"> ● Simple ● Multiple ● Nesting ● Logical Operators (>, <, ==, <, is, >=, <=) <p>Loops</p> <ul style="list-style-type: none"> ● While ● For 	

		<ul style="list-style-type: none"> ● For in ● Nesting ● Range ● Break ● Continue ● Over List ● Over String <p>Nesting of loops & conditions</p> <p>Exception handling</p> <ul style="list-style-type: none"> ● Try ● Except ● Finally 	
Week 9/26	Functions	<p>Syntax</p> <ul style="list-style-type: none"> ● Define ● Calling <p>Benefits</p> <ul style="list-style-type: none"> ● Reuse ● Code separation <p>Arguments</p> <ul style="list-style-type: none"> ● Default Arguments ● Optional Arguments ● Pass by Value & Reference <p>Recursive Functions</p> <p>Lambda Functions</p> <p>Variable Scope (Global, local)</p>	
Week 10/26	Projects	<p>Project examples</p> <ul style="list-style-type: none"> ● Paper Scissor Rock Game ● All Temperature calculator ● Unit conversion system ● Number guessing ● Marks grade/average calculations 	
Week 11/26	Packages/Modules & Object-Oriented Programming	<p>Packages</p> <ul style="list-style-type: none"> ● Examples (math, csv, os, sys) ● Modules ● <code>__init__.py</code> file ● Import <ul style="list-style-type: none"> ○ Start of file and in functions/blocks ● Circular import <p>Classes</p>	

		<p>Objects</p> <p>Methods</p> <ul style="list-style-type: none"> ● Class ● Object ● Static <p>Accessors</p> <ul style="list-style-type: none"> ● Private ('_') ● Public <p>Self</p> <p>Properties</p> <p>Constructor (__init__())</p>	
Week 12/26	Advance OOP 1	<p>Inheritance</p> <ul style="list-style-type: none"> ● Why ● Benefits ● Single ● Multiple ● Overriding ● Method overriding <p>Polymorphism</p> <p>Composition</p> <p>Operator Overloading</p> <p>Examples + Assignments</p>	
Week 13/26	I/O Operations	<p>File Handling</p> <ul style="list-style-type: none"> ● Open ● Modes (w, w+, wb, r) ● With Keyword <p>File Types</p> <ul style="list-style-type: none"> ● TXT ● CSV <ul style="list-style-type: none"> ○ Reader ○ Dict reader ○ Writer ○ Writerow ○ Writerows ● JSON ● XML <p>Nested Data Structures</p> <ul style="list-style-type: none"> ● Array <ul style="list-style-type: none"> ○ Array of array ○ Array of dicts ○ Array of tuples 	

		<ul style="list-style-type: none"> ● Dictionary <ul style="list-style-type: none"> ○ Array as values ○ Tuple as values ○ Dictionary as values 	
Week 14/26	Python Applications and Frameworks	Desktop Applications <ul style="list-style-type: none"> ● QT ● PyGUI ● Tkinter Web Applications <ul style="list-style-type: none"> ● Flask ● Django Machine Learning & Artificial Intelligence & Data Science <ul style="list-style-type: none"> ● PyTorch Python ● Pandas ● NumPy ● SciPy ● TensorFlow Visitor Lecture	
Week 15/26	Mid Term Assignment		
Week 16/26	Introduction to Data Science & Diff of Structured & Unstructured Data	Data Science <ul style="list-style-type: none"> ● Introduction ● Working with Structured data ● Numpy ● Pandas ● Matplotlib Introduction to Unstructured Data	
Week 17/26	Data Science Project	Mini Project	
Week 18/26	Introduction to Unstructured Data	Working with Audio Working with Image	
Week 19/26	Introduction to TensorFlow	Tensorflow API Hierarchy Graph and Session Visualizing a Graph	
Week 20/26	TensorFlow Project	Mini Project	

<p>Week 21/26</p>	<p>Employable Project/Assignment (6 weeks i.e. 21-26) in addition of regular classes.</p> <p style="text-align: center;">OR</p> <p>On job training (2 weeks)</p>	<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/ https://www.freestudentprojects.com/ https://technofizi.net/best-computer-science-and-engineering-cse-project-topics-ideas-for-students/ ● 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 style="text-align: center;">-----</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. 	
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Week 22/26	Introduction to Django or Flask	<ul style="list-style-type: none"> • Database • HTML • CSS • Migrations • Views • MVC • URLs • Templates 	
Week 23/26	Django Mini project	Django Mini project	
Week 24/26	Django Rest Framework	<ul style="list-style-type: none"> • JSON • API Calls • Token Auth • Serializers 	
Week 25/26	Final Project Progress	Final Project Progress	
Week 26/26	Final Project Evaluation	<ul style="list-style-type: none"> • Job Market Searching • Self-employment • Freelancing sites • 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 	

List of Machinery / Equipment

Sr. No	Name of item as per curriculum	Quantity physically available at the training location
1	Computers Minimum Core-i5 <ul style="list-style-type: none"> LCD Display 17" with built in speakers 	25
2	DSL Internet Connection (Minimum 1 MB)	Available on every PC
3	Accessories/Devices <ul style="list-style-type: none"> Connectors Multimedia Printer (NW printer) Audio/visual aid White Board Pin Board Flip Chart Board Hard copy of Training Material Mobile Phones 	25 each
4	Wires, data cables, power plugs, power supply	For every PC
5	UPS	Available
6	Generator / Solar Backup	Available
7	Air Conditioner (2 Tons)	Available

1. Software List

Sr. No	Software Name
1.	MS Office(Installed on each PC)
2.	Operating System (Windows, Linux or other Operating Systems)
3.	Programming Languages including PyCharm, Notebook

4.	Web Servers including IIS, Apache (Licensed software installed on each PC)
5.	Databases including MySQL, ERWIN (Licensed software installed on each PC)
6.	FTP Client including FileZilla, File Manager (Licensed software installed on each PC)
7.	Web hosting manager/control panel
8.	Web browser including Internet Explorer, Google Chrome, Mozilla Firefox, Netscape, Opera (installed on each PC)
9.	Firewall (each PC)
10.	Security scanning tools including Antivirus (each PC) Networking

2. Minimum Qualification of Teachers / Instructor

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

- Bachelor's of Computers Science / Networks / Electrical Engineering (Hons)

3. Supportive Notes

Teaching Learning Material

Books Name	Author
Python Crash Course	Eric Matthews
Learn Python the Hard Way	Zed A. Shaw
Python Programming: An Introduction to Computer Science	John Zelle