



CADVertex Solutions

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CAD Automation

Language: VB.Net or CSharp or Python

Training Structure

Module 1: VB.Net or CSharp or Python Programming.

Module 2: CAD Automation.

Bonus: AI and Machine Learning - FREE module.

Optional: AI and Machine Learning - FULL course.

Training Highlights



Online Training



Flexible Timings



Trainer: 25 yrs Exp.



Duration: 6 Wks



1 Hour Daily



Basic to Advanced



5 Industry Projs



Certificate



Support after Training



CuttingEdge Tech

List of Projects

1. Geometric Calculator
2. Engineering Apps
3. Batch Processing
4. Drawing Automation - Views
5. Drawing Automation - Title Blocks
6. Drawing Automation - Sketching
7. Part Modeling Automation
8. Assembly Automation

Module 1: CSharp.Net Programming

1. Installing Visual Studio

- Installing Visual Studio Community version.
- Setting the default language.
- Customizing the layout.
- Solution Explorer, Toolbox and the Properties windows.

2. Introduction to Programming

- Selecting a project template.
- Setting up user interaction and collecting inputs.
- Variable types - Double, Integer, and String.
- Acquiring user input from textboxes into variables.
- Calculations and display outputs.
- Using the .Net Math library functions.
- Various files and their meaning in the project structure.
- Separating source code from the executable.

3. Creating a Windows Forms Application

- Setting dialog box properties.
- Adding controls: Button, TextBox, Label, Checkbox, RadioButton.
- Adding images to PictureBox and other controls.
- Aligning text and images on controls.
- Composite controls: ListBox and ComboBox.
- Adjusting various properties for each type of control.

4. Arrays and Loops

- Filling arrays and reading array elements.
- Filling ListBoxes with array elements.
- ForEach loop.

5. Functions and Subroutines

- Arguments.
- Return Types.
- Return Values in Functions.
- Function Overloading.

6. Object Oriented Programming

- Creating a class.
- Adding member functions.
- Public and Private methods.
- Adding member variables.
- Encapsulation.
- Polymorphism.

7. Multi-Form Projects

- Adding Forms to a project.
- Form Constructor and object variables.
- Form objects and invoking Forms.
- Exchanging data between Forms.
- Standard Dialogs - Message Box, File Selection and Folder Selection.

Module 1: VB.Net Programming

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Module 1: Python Programming

1. Python and IDE Installation

- Installing Python.
- Installing Python Editors – PyCharm, IDLE.
- Project Explorer, output and error windows.

2. Python programming

- Setting up user interaction and collecting inputs.
- Running Python programs.
- Calculations and output display.
- Arithmetic operators.
- Using the Math library functions.
- Syntax, Comments, User Input, Print results, and control Program Flow.
- Variables: Float, Integer, and String.
- String Variables: Find, Replace, Formatting and Slicing operations.
- Datatypes and Typecasting.

3. List, Tuples, and Loops

- Lists, Tuples, Dictionaries and Sets.
- List Operations - Slicing and Data Extraction.
- String Operations - Slicing and Manipulations.
- Conditionals: If- Elif and If-Else, Nested If.
- Chaining Comparison Operators.
- Loops: For loop, nested For loops.

4. Functions and Modules

- Defining Functions and Arguments.
- Functions: Arguments, Return Statements and values.
- Functions: Multiple Return Values.
- Function Help and DocStrings.
- Modules and the Python standard library.
- Importing from modules.
- Creating Aliases.

5. Exception Handling

- Errors - syntax, logical and exceptions.
- Exception handling.
- Try Catch Except.
- Debugging Python Functions.
- Adding breakpoints and inspecting values.
- Determine source of error.
- Troubleshooting and fixing errors in the code.

6. OS Functions

- Installing 3rd party packages using pip.
- Performing File, Folder, Path and operations.
- Manipulating file paths and extensions.
- Handling Files, File Filters.
- Text files - read, append and write with practical applications.
- Storing and retrieving data.
- Folders and Folder operations.

7. Tkinter GUI Programming

- Dialogs and mainloop.
- Setting dialog box properties, title, icon, size and location.
- Adding widgets and adjusting their properties and placement.
- Tkinter Datatypes - Double, Integer, and Strings.
- Data Type Conversion - TkInter variables and python variables.
- Labels - static and dynamic.
- Entry Textboxes - storing user input from textboxes into variables.
- Setting default values and last used values in text boxes.
- Button widget - formatting and calling functions.
- Check boxes and radio buttons.

8. Advanced GUI Programming

- Listboxes - single selection and multiple selections.
- Listboxes - adding items static and dynamic.
- Listbox display total count and selection count.
- Listbox - add items from textbox.
- Listbox - remove items.

- Spinner widget - setting range and layout.
- Scale widget - setting range and layout.
- Images - displaying images in a dialog box.

- Message boxes - information, query and warning.
- Configuring single line and multiline messages.
- Button configurations and icons.
- Checking message box responses against button configurations.

- File selection dialog.
- Single and multiple files.
- Adding file filters.
- Folder selection dialog.
- Selecting all files from folder dialog.
- Adding file filters for folder dialog.
- Opening files in associated application.
- Handling multiple dialogs.

Module 2: CAD Automation

1. Getting Started

- ❖ Connect to CAD
- ❖ Getting information from the UI
- ❖ Read-write various properties of the UI

2. Documents Automation

- ❖ Document types
- ❖ Create new files - Part, Drawing and Assembly
- ❖ Open, Close, Save and SaveAs documents
- ❖ Close all documents in the Session
- ❖ Export documents to other formats
- ❖ Activate files in a session
- ❖ Loop through files in the session

3. File Handling

- ❖ Standard file dialogs to select files
- ❖ Setting file filters

4. Managing Sheets in Drawings

- ❖ Creating drawing sheets
- ❖ Accessing sheets in a drawing
- ❖ Counting and extracting sheet info
- ❖ Switching between sheets

12. Drawing Views

- ❖ Create drawing views

13. Handling Text in Drawings

- ❖ Access text objects in a drawing document

14. 2D objects in Drawings

- ❖ Creating 2D objects in a drawing document

15. Parametric Parts

- ❖ Control parametric part
- ❖ Expression and formulas - dimensions and variables

16. Assembly Automation

- ❖ Occurrences and components in an assembly.
- ❖ Handling root and children components.

Bonus = [FREE Module: Python and Machine Learning](#)

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5. Machine Learning - NumPy

- Arrays.
- One-Dimensional Array.
- Multidimensional Array.
- Create Arrays from Data.
- Create array from Ranges.
- Shape.
- Array Intersection.

- Array Difference.
- Sum.
- Slicing Array.

6. Machine Learning - Pandas

- Series.
- DataFrames.
- Dataframe Indexing.
- Dataframe Head, Tail.
- Dataframe Shape.
- Read DataFrame from CSV.

7. Matplotlib Visualization

- Line Plots.
- Sub Plots.
- Plot Properties - Color, Style.
- Grid, xLabel, yLabel.
- Bar Plots.
- Bar SubPlots and Orientation.
- Scatter Plots and Subplots.
- Mixed Plots and Overlapping.
- Markers and LineWidth.
- Exporting Plots.
- Pie Charts.

8. Linear Regression Analysis

- Reading a CSV data file.
- Create Linear regression model.
- Fit data columns directly to the algorithm.
- Determine coefficient and intercept.
- Reading inputs data from CSV.
- Predicting output for entire column.
- Exporting output dataframes to CSV.
- Create a scatter plot of the data.

Paid Module: Machine Learning and AI

= FREE Module + the following topics:

1. Decision Trees

- Decision Tree Classifiers.
- Dataframe.
- Extracting Features & Labels from a Dataframe.
- Fitting Features & Labels into a decision algorithm.
- Predicting values based on classification.
- Dual Classification and Multiclass classification.
- Reading CSV data into Dataframes.
- Separating input and output.
- Dropping frames from dataframes.
- Label Encoders.
- Fit Transforms.
- Predicting results.

2. K-Means Clustering

- Importing data.
- Determining clusters.
- Determining the cluster to which a point belongs.
- Visualize cluster using scatter plots.
- Visualize cluster centers.

3. How to use ChatGPT for API Development

- Creating smart queries.
- Enhancing queries for best results.
- Refining queries for exploring more APIs.
- ChatGPT Code cleanup and adaptation.

4. Integrate AI and ML in Automation

- **Capstone Project** Integrate Automation with Machine Learning to create AI-enabled apps.

5. AI in Manufacturing

- **Use Case 1:** Predictive Maintenance with Regression Models.
Predict the *Remaining Useful Life (RUL)* of components based on sensor data (temperature, vibration, load, humidity), example: Ball Bearing Life
- **Use Case 2:** Process Optimization with Clustering

6. AI in Structural Engineering

- **Use Case:** Beam Design. SFD and BMD Diagrams and plotting for cantilever and simply supported beams. Deflection curve calculations and plotting. Summary table, critical values and multi-sheet PDF export.

7. Enhance CAD Automation using AI

- **Use Case 1:** Enhancing Batch Processing of CAD Models with Clustering. Algorithm choice. Preprocessing & Feature Encoding. Integration with CAD Automation.

- **Use Case 2:** Improving Assembly Cost Calculation with Classification & Regression

8. Advanced NumPy and Pandas

- **Use Case 1:** Beam Design & Optimization Tool. Auto-select the lightest standard steel section that meets deflection and stress limits.

- **Use Case 2:** CNC Tool Wear & OEE Monitoring System. Solve real manufacturing floor problem of predicting when tools will fail and track machine efficiency from live data.

9. Google AI Studio for Engineers

- **Use Case:** Create a detailed drawing checker and compare app that also creates detailed reports.

10. Claude and Enhancing Engineering Excel using AI

Translate your Excel sheet logic into a .Net Windows Forms application. Extract the formulas and inputs from Excel sheet, create VB.Net and CSharp program with a form, labels, textboxes, outputs, and a picture box to display the diagram

- **Use Case 1:** Migrate old Excel sheets to .Net engineering application with a modern dialog interface.

- **Use Case 2:** Migrate old Excel VBA macros to .Net engineering application with a modern dialog interface.

11. Natural Language Processing and its applications in engineering BoM

- **Use Case:** End-to-end workflow for extracting BoM data from a CAD assembly and using ML and AI techniques like regression, clustering, matplotlib, Scikit-Learn and NLP to analyze and manipulate engineering BoMs.

Applying NLP techniques like tokenization, lemmatization, stemming and NER to engineering BoMs.

12. Google Notebook LM

- **Use Case 1:** Create a drawing compare tool that examines and compares spatial layouts and geometric relationships, dimensions, notes, GT&T, and title block changes.
- **Use Case 2:** Create a CAD automation code writing engine using Small Language Models or SLMs.

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- ❖ NX Open: VB.Net or CSharp with Win Forms
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- ❖ Knowledge Fusion with Block UI Styler

- ❖ [Revit API – Plugin creation using CSharp and Python, Dynamo](#)
- ❖ [Tekla Open API programming](#)

- ❖ cMayoCAD: Learn to build a new CAD program from scratch using a Geometric Modeling Kernel and CSharp

- ❖ Machine Learning for Engineers with Python
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- ❖ NX Automation and Machine Learning with Python
- ❖ Solid Edge Automation with Python + Machine Learning
- ❖ SolidWorks Automation with Python + Machine Learning
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