SAVITRIBAI PHULE
PUNE UNIVERSITY
(Formerly University of Pune)

DRONEACHARYA
AERIAL INNOVATIONS
LIMITED

Board of Studies,
Department of Technology

Electronics & Electrical (EE) Technology

Curriculum Structure for

Professional Certification Programme

in

CERTIFICATE COURSE IN PYTHON FOR DRONES GIS

Course Name: Professional Certification Programme in

CERTIFICATE COURSE IN PYTHON FOR DRONES GIS

Compulsory Modules – 4

Duration: 15 DAYS

Course Intake: - 40

Course Mode: - Classroom (Hybrid)

Eligibility Criteria:

10th Pass
Education Background:- Should able to read,Understand& write English/Hindi

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Department of Technology
Board of Studies, Electronics and Electrical Technology(EE)

Curriculum Structure for Professional Certification

Programme in

CERTIFICATE COURSE IN PYTHON FOR DRONES GIS

Sr. No.	Subject Code	Subject Name	Credits	Teaching Scheme (Theory)	Teaching Scheme (Practical)
1	**CCPDG1**	INTRODUCTION TO PYTHON -1	2	√	√
2	**CCPDG2**	INTRODUCTION TO PYTHON -2	2	√	√
3	**CCPDG3**	INTRODUCTION TO GIS -1	2	√	√
4	**CCPDG4**	INTRODUCTION TO GIS -2	2	√	√
		Total Course Credits	**8**		

TAKEAWAYS AFTER COMPLETION OF (CCPDG) COURSE

This the synergistic integration of programming skills with geospatial knowledge, which empowers individuals to fully leverage the capabilities of UAVs and GIS technology. Upon completion of this course, students will have developed the necessary competencies to automate geospatial processes, optimize the processing of data obtained by drones, and conduct sophisticated spatial analysis through the utilization of Python programming. In addition, individuals will possess the capacity to develop personalized geospatial tools and applications that are specifically designed for drone-related activities. This course enables learners to develop proficiency in utilizing Python as a tool for manipulating data, conducting geospatial analysis, and automating processes. This skill set is highly relevant in the drone business, where the ability to process data and perform spatial analysis is crucial for making informed decisions and driving innovation.

CCPDG1 : INTRODUCTION TO PYTHON -1

Learning Outcomes

The participants will acquire fluency in Python, a versatile programming language that is widely utilized in the fields of Geographic Information Systems (GIS) and drone data processing. Students will acquire the knowledge and skills necessary to employ loops and conditional statements in order to automate data processing processes that involve repetitive actions. This automation will result in improved work efficiency, particularly in areas such as image stitching, georeferencing, and feature extraction. In addition, students will acquire proficiency in utilizing data structures to efficiently handle and examine geospatial data derived from footage collected by drones. This skill is crucial for various applications including land surveying, environmental monitoring, and precision agriculture. This module provides individuals with practical programming skills, allowing them to effectively utilize the combined potential of Python, GIS, and drone technology for the purpose of efficiently and accurately extracting valuable insights from spatial data. Consequently, this contributes to the advancement of data-driven decision-making and innovation within the drone industry.

Syllabus

Introduction of Programming Language: Introduction to Programming Language, What is Programming Language, Types of Programming Language(Higher, Lower), Difference between interpreter and compiler with examples What is Python, Applications of Python, Advantages Disadvantages of Programming Language, What is Syntax.

Installation of python and first program: Installation of Python, First Program, Basic arithmetic operators, What are Keywords.

Quiz

Exam: What is Python? **Who** created Python? What are the key features of Python? Is Python an interpreted or compiled language? What is the latest stable version of Python? What are the two major versions of Python that are currently in use? What is the Python Standard Library? What are the different data types supported by Python? What is the purpose of indentation in Python code? What is PEP 8, and why is it important in Python development? What are the advantages of using Python for software development? What platforms does Python support? How do you install Python on Windows? How do you install Python on macOS? How do you install Python on Linux? What is pip, and what is its role in Python? How do you install packages or libraries using pip? What is a virtual environment, and why is it useful in Python development? How do you create and activate a virtual environment in Python? What is the recommended way to manage different Python versions and environments on the same system?

Assignment

Arithmetic Operations: ,Write a Python program to add two numbers. ,Write a Python program to subtract two numbers.Write a Python program to multiply two numbers. Write a Python program to divide two numbers. Write a Python program to calculate the square of a number. ,Write a Python program to calculate the square root of a number. ,Write a Python program to calculate the area of a rectangle given its length and width. ,Write a Python program to calculate the perimeter of a circle given its radius. ,Write a Python program to convert Celsius to Fahrenheit. ,Write a Python program to convert kilometers to miles. ,Take input from the user and print Take input from the use and use all arithmetic operator (+, -, %, *, **, /, //) (ex- Arithmetic op)
-The sum of 3 digit numbers (43 = 4+3 = 7) ,Write a program to calculate the percentage of students based on marks in any 5 subjects. ,Write a program to calculate the area of a rectangle based on length and breadth.

Assign two numbers and swap them using the third variable. Assign two numbers and swap them without using a third variable.

Installation

Explain the process of installing Python on a Windows system What is pip? How do you use it to install Python packages? Explain the concept of a virtual environment in Python ,-How do you create a virtual environment using the built-in module in Python? How do you activate a virtual environment on a Windows system? How do you activate a virtual environment on a macOS or Linux system? What is the purpose of a requirements.txt file? How do you use it to manage project dependencies?
How can you check the version of Python installed on your system using the command line?

Questions and Answers

Conditional Looping What is Conditional Looping ,Types of Conditional Looping if if else ,if else ladder, Nested if else

Quiz

Exam

Assignment

Questions and Answers

Data Structures ,Introduction to data structures ,Types of Data Structures and their methods List, Sets Methods,Tuple ,Dictionar

Quiz

Exam

Assignment

Questions and Answers

Looping ,What are loops ,Types of loops, While For

Quiz

Exam

Assignment

Questions and Answers

CCPDG2: INTRODUCTION TO PYTHON-2

Learning Outcomes

Students will acquire knowledge on the principles of function design and implementation, which play a vital role in promoting code reusability and modular programming. These skills are essential for developing drone applications that are scalable and easy to maintain. By acquiring knowledge of the fundamentals of object-oriented programming, students will possess the necessary skills to effectively design and structure software projects linked to drones. This will result in improved code organization and enhanced readability. Proficiency in exception handling is crucial for developing resilient and fault-tolerant code, particularly in the context of drone applications where reliability is of utmost importance. This module provides individuals with a wide range of programming skills, enabling them to succeed in many positions within the drone sector. These positions include data processing and analysis, drone software development, and automation. Ultimately, these skills contribute to advancements and increased efficiency in the field.

Syllabus

File Handling: Read Write Append , Read ,Write Append.

Quiz
Exam

Assignment

Questions and Answers

Functions , What is functions

Quiz

Exam

Assignment

Questions and Answers

Object Oriented Programming(OOP), What is OOP, Pillar of OOP, Abstraction, Encapsulation, Inheritance, Polymorphism

Quiz

Exam

Assignment

Questions and Answers

Exception Handling, Handling Specific Exceptions: In Python, you can handle specific exceptions by using

separate Except blocks for each exception type. This allows you to customize error handling, based on the specific exception that occurred., Exception Hierarchies: Python exceptions are organized in a hierarchy,with the base class being BaseException., Understanding the hierarchy can help you handle exceptions more effectively, by catching specific exceptions or their parent classes., The else Clause: In addition to the try and except blocks, Python provides an, optional else block that can be used to, specify code that should be executed if no exceptions occur within the try block.This can be useful for separating the exception handling logic from the regular code flow., Raising Exceptions: In Python, you can explicitly raise exceptions using the raise statement.This allows you to create custom exceptions or re-raise exceptions caught in an Except block.
Understanding how to raise exceptions is important for creating well-defined error handling codeException Handling Best Practices: Exception handling is a critical aspect of writing robust and maintainable code. Learning and following best practices for exception handling, such as avoiding broad exception handling, logging exceptions, and gracefully recovering from errors, can significantly improve the reliability and quality of your Python programs

Quiz

Exam

Assignment

Questions and Answers

Introduction to Numpy

Introduction to Pandas

Quiz

Exam

Assignment

Questions and Answers

CCPDG3: INTRODUCTION TO GIS -1

Learning Outcomes

The course module will facilitate participants in acquiring expertise in utilizing QGIS, hence enhancing their ability to efficiently modify and visually represent geographical data. Students will also acquire the skills to use both vector and raster data structures, enabling them to generate, analyze, and administer geographic datasets. In addition, students will acquire fundamental coding skills in the Python programming language, with a specific focus on the manipulation and interpretation of geographical data. Upon completion of the course, attendees will possess the necessary skills and knowledge to effectively utilize the collaborative potential of GIS, QGIS, and Python programming in order to tackle practical spatial issues. This will empower them to efficiently handle geospatial data and foster innovation in various domains, including urban planning, environmental science, and resource management.

Syllabus

What is GIS: What is Spatial Data Analysis?, Data types of GIS, Vector, Raster.

Quiz

Exam

Assignment

Questions and Answers

Introduction to QGIS, Interface, What are Plugins,Tools in QGIS, Python Console

Vector Data type, What is Vector data, Types- Point, Polygon, Line String, What is attribute table, Types vector files, Introduction to Google Earth Engine with Python, Working with Earth Engine Code Editor, Earth Engine API operation, Image Collection and adding them on map, Adding different available datasets and visualizing the imagery

Raster Data type, Continuous and Discrete Raster Data, Types of Raster data, Thematic raster data, Imagery raster data, Spectral raster data

Quiz

Exam

Assignment

Questions and Answers

Introduction to Google Earth Engine with Python., Working with Earth Engine Code Editor, Earth Engine API operations., Image Collection and adding them on map, Adding different available datasets and visualizing the imagery

Quiz

Exam

Assignment

Questions and Answers

CCPDG4: INTRODUCTION TO GIS -2

Learning Outcomes

The primary objective of this module is to equip students with advanced knowledge and skills in geospatial analysis, enabling them to effectively tackle intricate spatial problems. The participants will get the proficiency to create customized algorithms with Google Earth Engine, hence facilitating the effective processing and analysis of extensive geospatial data. In addition, students will acquire knowledge in conducting time series analysis, whereby historical data is utilized to monitor temporal changes and patterns. Furthermore, they will get proficiency in employing machine learning methodologies for the purposes of object detection and categorization. Students will acquire the necessary skills to effectively integrate various data sources, such as remote sensing imagery and ground-based data, in order to conduct thorough spatial analysis. Furthermore, the individuals will acquire proficiency in the field of cloud computing and big data processing, enabling them to efficiently manage extensive geospatial datasets of significant magnitude. Upon completion of the course, participants will possess the necessary skills and knowledge to effectively utilize advanced Geographic Information System (GIS) techniques in order to tackle practical issues in various domains, including but not limited to environmental monitoring, urban planning, and disaster management. This will enable them to make informed decisions based on data analysis and contribute to the advancement of geospatial applications through innovative problem-solving approaches.

Syllabus

Custom Algorithm Development with Google Earth Engine**,** Time Series Analysis, Machine Learning with Earth Engine And object detection., Fusion of Multiple Data Sources,Cloud Computing and Big Data Processing Visualization.

Quiz

Exam

Assignment

Questions and Answers