

THE 4th WCO BACUDA SCHOLARSHIP PROGRAMME ON DATA ANALYTICS

General presentation

A three-month face-to-face capacity development programme designed to enhance the data analytics capabilities of officials from Member Customs administrations.

I. Programme Overview

In the evolving global trade environment, the role of Customs administrations has become increasingly important in supporting economic resilience through effective border controls, trade facilitation and the promotion of legitimate trade. To remain effective and responsive, Customs administrations must continuously adapt to technological developments, emerging risks and changing patterns of international trade.

II. Programme Framework

The programme is a three-month, non-degree, face-to-face capacity development programme. The aim of this programme is to enhance the capacity of Customs officials in the area of data analysis. Data analytics has become an enabler for modern Customs administrations, supporting risk management, trade facilitation, compliance enhancement, evidence-based decision-making, performance measurement, resource optimisation and operational effectiveness. Customs has a substantial amount of data at its disposal, beginning with data submitted for the Customs clearance process. Thanks to the development of digital technology, Customs administrations can leverage internal operational data, information shared by other government agencies, commercially available databases and open-source information platforms.

The framework of the programme includes:

- Fundamentals of Data Analytics and Big Data
- Fundamentals of Machine Learning
- Python Programming
- Applied Advanced Analytics
- Data Technology
- WCO BACUDA Algorithms and Applications
- WCO Topics, including Data Strategy and Policy for Members.

III. Participant Selection and Eligibility Criteria

1. The number of participants in the programme will be twelve (12). Given the objectives of the programme, they should be working-level officials of Customs administrations in developing countries.
2. The candidates should be in good health and with good communication skills.
3. Officials who apply for the Programme must meet all of the following requirements:
 - (1) Certification of completion of the Data Analytics - Beginners Course on WCO CLiKC!;
 - (2) At least two years of experience working in Customs Data Analytics;
 - (3) Proof of English proficiency.

IV. Funding

The programme will be financed through CCF-Korea, funded by the Korea Customs Service. The fund will cover travel costs, health insurance costs, tuition fees, institutional costs, accommodation costs and other approved incidental expenses, to enable the participants to complete the programme.

V. Programme Structure and Description

1. Course Description

The programme consists of face-to-face courses and practical activities structured around the following modules:

- 1) Programming with Python for Customs Applications
- 2) Introduction to Data Science
- 3) Introduction to AI tools
- 4) Data Collection and Cleaning in Customs
- 5) Data Visualization and Dashboards for Trade Insights
- 6) Applied Statistics and Probability in Customs Analytics
- 7) Machine Learning for Risk Profiling and Anomaly Detection
- 8) International Customs Trends
- 9) Natural Language Processing for Customs Texts
- 10) WCO BACUDA models

2. Curricular Module

At the end of the programme, each participant must submit to the University a research paper on a Customs topic concerning analytic model development, applying the knowledge, skills and methodologies acquired throughout the programme. The research paper must be validated by the participant's tutor and must demonstrate the participant's analytical skills, understanding of the topics and discussions from the programme, and his/her strategic ability and skills. Below are the modules, which are subject to changes that will be made known to participants in due course.

Module 1	Programming with Python for Customs Applications
1	Introduction to Python for Data Processing
2	Core Python Programming Fundamentals
3	Object-Oriented Programming (OOP) in Python
4	Working with Files (CSV, JSON, XML)
5	Data Manipulation Using Pandas and NumPy
6	Error Handling and Debugging Strategies
7	Practical Project
Module 2	Fundamentals of Data Science
1	Overview of the Data Science
2	Frequent Pattern Mining
3	Decision tree and random forest
4	Basics of AI and ML
5	Exploratory Data Analysis (EDA) Fundamentals
Module 3	Introduction to Artificial Intelligence tools
1	Introduction to Large Language Models (LLM)
2	Fundamentals of text generation with AI
3	Fundamentals of image generation
4	AI-Assisted Coding & Data analysis
5	Introduction to AI Agents
6	Practical Application of AI in Customs

Module 4	Data Visualization and Dashboards Development for Trade Insights
1	Data Visualization Principles
2	Visualizing Trade Data Patterns
3	Visualization Tools and Libraries
4	Visual Storytelling for Customs Investigations
Module 5	Applied Statistics and Probability in Customs Analytics
1	Descriptive Statistics
2	Distributions and Percentiles
3	Hypothesis Testing in Trade Volumes
4	Correlation vs. Causation
5	Sampling Techniques for Inspection Planning
6	Bayes' Theorem in Risk Modelling
7	Practical Project
Module 6	Machine Learning for Risk Profiling and Anomaly Detection
1	Introduction to Machine Learning for Customs Analysis
2	Supervised vs. Unsupervised Learning
3	Classification Models for Risk Detection
4	Clustering Techniques for Anomaly Detection
5	Handling Imbalanced Datasets
6	Evaluation Metrics and Model Validation
7	Practical Project
Module 7	Understanding Customs in Global Trade
1	Data in Customs (WCO Data Model)
2	Customs Case Studies
Module 8	Natural Language Processing for Customs Texts
1	Text Preprocessing
2	Text Vectorization Techniques
3	Named Entity Recognition (NER) for Trade Documents
4	Classification Using Textual Data

- 5 Pattern Extraction with Regular Expressions
- 6 Practical Project

Module 9	WCO BACUDA Algorithms and Applications
1	Introduction to the WCO BACUDA Project
2	BACUDA Algorithm: DATE for Customs Fraud Detection
3	BACUDA Algorithm: AI-HS for HS Code Classification
4	BACUDA Algorithm: Synthetic Data Generation and Image Data Analysis

3. Programme Schedule

- **All schedules are provisional and subject to change** (*Please see detailed programme in excel file*)
- **Best Practice on Data Analytics will be presented by each participant during the face-to-face classes, to share ideas and receive insights from classmates and professors.**
- **Classes will be organized by HYU in cooperation with the KCS and the private sector.**

VI. Participant Responsibilities

To strengthen their analytical capabilities and develop practical analytical models throughout the programme, they are invited to receive an orientation session from the training academy in the beginning of the course to select a topic for each group project and undertake study on an assigned topic jointly agreed within participants in cooperation with tutors from the academy and the HYU.

- A report to evaluate his/her performance and outcome of the course should be written by individual trainee (or each group) and submitted to the HYU and the WCO
- Reporting should be made twice for the whole course, which consists of a Mid-term progress report and a final report. Necessary template and detailed instructions for this task will be informed by the HYU during the orientation.
- Mid-term report should be submitted **within one month after** the opening and final report should be submitted **before closing ceremony**. The report should be sent to BACUDA@wcoomd.org.

Annex 1. BACUDA Scholarship Syllabus

Subject	Hours	Head Professor	Affiliation
• Welcome remark / Orientation	5	Eul Gyu Im	WCO/HYU
• Invited Talk	10	TBD	KCS
• Korean Language	10	IIE Hanyang Univ.	HYU
• Programming with Python for Customs Applications	18	Donghyeon Cho	HYU
• Introduction to Data Science	18	Dong-Kyu Chae	HYU
• Introduction to AI tools	18	Taehyun Kim	HYU
• Data Visualization and Dashboards for Trade Insights	18	Sang-Yong Tom Lee	HYU
• Data Collection and Cleaning in Customs	18	Yeongpil Cho	HYU
• Applied Statistics and Probability in Customs Analytics	18	Sungshin Kim	HYU
• Machine Learning for Risk Profiling and Anomaly Detection	18	Dong-Kyu Chae	HYU
• Understanding Customs in Global Trade	12	Yang Shen	HYU
• Natural Language Processing for Customs Texts	18	Kyungsik Han	HYU
• Capstone Projects	24	Heejung Park & Advisors	HYU
• BACUDA Algorithms	18	TBD	WCO
Total	223		