# CARDANO ACADEMY

## eUTxO Smart Contracts with Aiken

Course Overview

# Overview

Unlock the power of Cardano's smart contract capabilities with this technical mini-course from the Cardano Foundation. We've designed this program to demystify the eUTxO model and provide a beginner-to-intermediate level introduction to Aiken, the modern smart contract language for Cardano.

This course dispels the myth that you need to learn Haskell to develop on Cardano. Move beyond a surface-level understanding and explore the technical mechanics that power dApp development on a leading Proof-of-Stake network.

| | |
|---|---|
| **Course** | **eUTxO Smart Contracts with Aiken** |
| **Track** | Technical |
| **Format** | Free, Self-paced, On-demand E-learning |
| **Audience** | Developers new to Web3, developers from other blockchains, & existing Cardano community members |
| **Outcome** | Digital Badge & advanced step toward Cardano smart contract specialization |

## Why This Course Matters

As distributed ledger technology evolves, understanding the unique architecture of Cardano is crucial for developers looking to build secure and scalable applications. This course provides a deep dive into the eUTxO model, contrasting it with the account-based model to highlight its benefits for parallelism, security, and determinism.

You will gain a clear understanding of Aiken, a modern language designed to simplify development and optimize smart contract performance on Cardano. This program is essential for onboarding the next wave of developers into the Cardano ecosystem.

# Key Takeaways

In this program, you will:

- **Gain a comprehensive understanding of Cardano's eUTxO model** and its advantages over the account-based model.
- **Explain the typical architecture of a Cardano dApp,** including on-chain and off-chain components.
- **Describe the evolution of smart contract languages on Cardano,** from Plutus to Aiken.
- **Learn the fundamentals of Aiken** to write, build, and test your own on-chain validators.
- **Outline the next steps for your development journey,** with resources for hands-on coding and ecosystem tools.

# Who Is This Program For?

This course is designed for individuals who wish to move beyond a surface-level understanding of blockchain and delve into the technical mechanics of building smart contracts on a leading Proof-of-Stake network. Representative roles include:

- **Developers new to web3** who are looking to write smart contracts on Cardano.
- **Developers from other blockchains** who are unfamiliar with the eUTxO model, Cardano, and Aiken.
- **Existing Cardano developers** who want to use the course as a recap or participate in coding challenges.
- **Anyone who completed the Blockchain Fundamentals or CBCA courses** and is looking to further their technical knowledge.
- **Technical professionals** interested in the foundations of Cardano's protocol and its modern tooling.

# Your Learning Journey

During this online journey, you will explore the practical mechanics of building smart contracts with Aiken through learning methods designed with you in mind. The course is delivered via a feature-rich platform with on-demand e-learning and mobile access, allowing you to learn on the go.

Each module offers the opportunity to apply the concepts taught through detailed explanations and worked examples directly from the course script. You'll gain a practical understanding of how to build and test secure validators, preparing you for real-world dApp development on Cardano.

# Program Modules

## Unit 1: Intro & Recap

**This unit sets the stage for the course**, providing a brief recap of concepts from the Cardano Blockchain Certified Associate (CBCA) course. It introduces the **Cardano Stack**, explains the fundamental concepts of **state** and **state machines** in the context of blockchains, and offers an initial comparison of the **UTxO and Account-based models**.

## Unit 2: Intro to UTxO and Account Model

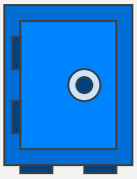
**This unit dives into the origins of blockchain accounting models.** It starts with an exploration of **Bitcoin's UTxO model**, discussing its strengths, weaknesses, and the limitations of **Bitcoin Script.** The unit then transitions to Ethereum, introducing its **account-based model**, the concept of a **global state**, and its smart contract language, **Solidity**.

## Unit 3: UTxO vs Account Model Deep Dive

**Building on the previous unit,** this section provides a more in-depth comparison of the two dominant accounting models. It explores **Cardano's research-driven origins** and contrasts how each model handles **state transitions, sharding, storage requirements,** and **privacy**. The unit concludes by examining how state transitions are specifically managed on Cardano.

## Unit 4: eUTxO

**This unit focuses on Cardano's innovation: the Extended UTxO (eUTxO) model.** It breaks down key components like **Datums and Redeemers**, explains the different types of **Cardano addresses**, and details the two-phase **transaction validation process**. The module also covers the creation and management of **native assets** on Cardano.



## Unit 5: eUTxO and Cardano

**Here, the course explores the practical implications of the eUTxO model for Cardano's ecosystem.** It covers scaling solutions like **Hydra** and innovative features like **Babel Fees**. The unit also looks to the future with **Ouroboros Leios** and discusses the potential for **ZK Rollups** on Cardano, while also touching on wallet security and DeFi considerations for developers.

## Unit 6: Haskell, Plutus, and Aiken

**This unit delves into the programming languages used for smart contract development on Cardano**. It explains the roles of **Haskell** and the **Plutus Platform**, including **Plutus Core** and the different **Ledger Eras (V1, V2, V3)**. The unit then introduces **Aiken** as a modern, developer-friendly alternative that compiles to Plutus Core.

## Unit 7: Getting Started with Aiken

**This is a hands-on unit that guides you through the initial steps of using Aiken.** You will learn how to **install the toolchain**, create your first project, and understand the basic folder structure. The unit also covers fundamental concepts like creating **helper functions**, defining custom **types**, and using **anonymous functions**.

## Unit 8: Aiken Validators

**This practical unit walks you through building several Aiken validators using a restaurant analogy.** You will code validators for managing reservations, placing and confirming orders, handling payments, managing a tipping jar, and even creating a "Chef's Special" NFT. This unit is designed to give you practical experience with common smart contract patterns.

## Unit 9: More Advanced Patterns

**This unit introduces more advanced concepts and best practices for writing Aiken validators.** It covers patterns for avoiding common issues like **UTxO contention** and **double-spending**, ensuring your smart contracts are both efficient and secure.

## Unit 10: Conclusion

**The final unit provides a comprehensive recap of the course content.** It offers a clear path for **next steps** in your learning journey, pointing you to essential documentation, hands-on courses, and developer communities to continue building your skills with Aiken and Cardano.

# The Learning Experience

Our programs are designed to meet the needs of individual learning styles while also leveraging the power of expert-verified information. This is achieved through a user-friendly learning platform that enables participants to easily navigate the program content.

**On-demand E-learning:**
Learn at your own pace, on your own schedule.

**Gamified Reinforcement:**
Engage with the material through the Quiz Room and Trophy Room with interactive and community elements that aid retention.

**Mobile Access:**
Access your courses anytime, anywhere, on any device.

**Open-Source Materials:**
Benefit from our commitment to open-source education.

## Technical and Business Learning Tracks

Cardano Blockchain Certified Associate **(CBCA)**

08:30 hrs | 4 Modules

Intermediate | Technical | Certified


**Available in English and Portuguese**


Business

Blockchain Fundamentals


Technical

Staking Rewards and Calculations


Technical

Aiken: Smart Contracts on Cardano

Coming soon

**Validate skills and expertise with digital badges**

# What Our Learners Say

> Wow...awesome and interactive lessons.

> The concept was well delivered.

> The course provides me with a deep understanding of hash functions and their critical role in information security.

> I really enjoyed studying the Hard Fork Combinator application.

> I was captivated by the analysis of the story about the Nakamoto coefficient when measuring the decentralization of a blockchain network.

> Very valuable information about Cardano's architecture and operation.

> I fully understand the course and am very excited about these highly technical and in-depth topics...

# Your Path to Certification

## 1. Complete the Course & Earn Your Badge


Upon successful completion, the Cardano Foundation grants a **verified digital badge**. This LinkedIn-compliant credential validates your new skills and expertise.

## 2. Advance to a Certified Associate (CBCA)

For learners wishing to advance their knowledge, the next step is the Cardano Blockchain Certified Associate (CBCA) exam. This recognized professional certification validates your technical and strategic blockchain knowledge.

Practice Exam and
Completion Badge

Certification: $99,
Online, 90 min., 50 Questions

LinkedIn-Compliant
Credential via Credly


**In Partnership with Pearson VUE and Credly**

# Meet Your Academic Team and Subject Matter Experts

The Academy team is made of Education, Enterprise, and Technical Talent, with 15-20+ years of experience each. We work closely with our subject matter experts to ensure quality, accuracy and relevance.

## The Academic Team

**Nadia Mannell**
Director

**Andrea Derman**
Business Development Manager

**Vanessa Hurhangee**
Education Manager

**John Greene**
Technical Blockchain Writer

**Heidi Staples**
Editor & Instructional Designer

**Niklas Göke**
Business Blockchain Writer

# The Subject Matter Experts

**Thomas Mayfield**
Team Lead - Decentralized Trust and Identity Solutions

**Michiel Bellen**
Core Integrations Team Lead

**Denicio Bute**
Community Manager

**Matthias Benkort**
Technical Director of Open Source Development

**John Wright**
Senior Legal Counsel

**Nicolas Cerny**
Governance Lead

**Fabian Bormann**
Team Lead - Ecosystem Engineering

# Trusted by Global Partners

PETROBRAS · Serpro · SEE INSTITUTE Sustainability through Research & Education · WOMEN in tech · Credly · DUBAI BLOCKCHAIN CENTER · BOOK · coursera · BINANCE ACADEMY · Pearson VUE

**10,000+** registered learners

# About the Cardano Academy

The Cardano Academy provides **quality-verified, up-to-date blockchain education and enablement**. Our offerings are designed to empower individuals and enterprises with the knowledge and skills needed to succeed in the evolving world of blockchain.

We provide a range of learning opportunities, from self-paced online courses and corporate masterclasses to diploma programs and professional certifications. Our mission is to foster a global community of educated, capable, and innovative contributors to the Cardano ecosystem.

# Ready to Begin?

Unlock the power of Cardano and take the next step in your blockchain education.

**Register for Free at:**

https://cardanofoundation.org/academy

# CARDANO ACADEMY