

Polkadot developers Course Syllabus

This syllabus is designed by Africa BloT Labs to facilitate the training of Developers during the 2 month Bootcamp on Polkadot in Tanzania. It remains the property of Africa BloT Labs but can be used by external entities and is open to further development toward attaining cross-border perfection.

Instructions for using this Course Syllabus Template

- The syllabus is broken into discrete sections, which can be rearranged, or modified to best fit your course and teaching style.
- The syllabus also includes references to, and instructions for accessing, the various tools suitable for use by developers trainers, and trainees alike.
- Adjust descriptions of activities and outcomes to fit your course depending on the environment and audience.
 - Be sure to remove references to tools, activities, or outcomes that you do not plan to use in your course.
- This curriculum is simplified in order to include developers not experienced with Rust and other methods of developing a smart contract on Polkadot with resources such as ink.

Endeavor to criticize and suggest improvements

You can suggest improvements backed up with resources and data on areas in this curriculum that can be enhanced to best suit the purpose. This can be attained by commenting on the document. Remember to cite records, research data, or sources.

However, do note that this method is a marathon training to enable knowledge acquisition in a short period of time. A more ideal scenario will at least double the expected time to conclude and adequately complete each module.

Course Syllabus

Part 1: Understanding and working with Polkadot Blockchain

Instructor Information

- **Instructor:** (One for each University) *to be allocated*
- **Office:** Physical, United Republic of Tanzania
- **E-mail:** pkdtraining@biotlabs.africa

Course Description

- Polkadot is a network of interoperable but independent blockchains that share security. In order to solve the scalability and interoperability challenges facing many blockchains, Polkadot creates a sharded ecosystem that includes the main relay chain and individual parachains (shards).
- This course provides from basic to intermediary and then the expert level of understanding and working with/on the Polkadot blockchain network.

Prerequisite/Corequisites

- Participants of this course must have successfully completed the blockchain for professionals certification. The blockchain for professionals training modules successfully covers all aspects of blockchain basics and application areas.
- Install Rust and Cargo. (<https://doc.rust-lang.org/cargo/getting-started/installation.html>)
- Create a Polkadot account (<https://wiki.polkadot.network/docs/learn-account-generation>)
- Get ROC testnet tokens from the faucet.

Course Materials

- **Recommended Texts & Other Readings:**
 - stevedonovan.github.io
 - <https://doc.rust-lang.org>
 - <https://wiki.polkadot.network/docs/getting-started>
 - <https://use.ink/>
 - <https://wiki.polkadot.network/>
 - <https://docs.substrate.io/>
 - The slide presentation will also be made available during and after each session

- for further learning.
- Presentation slide will also contain hyperlinks for other recommended online readings.

Course Requirements

- Internet connection (DSL, LAN, or cable connection desirable)
- Access to functional laptop
- General knowledge of software development and using command-line interface
- Successfully installed Rust compiler and toolchain.
- Other tools and requirements to be provided by the instructor.

Online Course Structure

This is fully an offline course made hybrid due to the recorded sessions archived for rewatching by participants and evaluation purposes. All course activities and resources will first be shared in the community/group and then archived on the website for reference during the sessions and post-Bootcamp. At designated times throughout the training weeks, we will participate in a blend of self-paced and group-paced activities using telegram and dedicated Whatsapp groups such as discussion forums, email, journaling, blogging, wikis, and web posting. All of the learning activities will be completed in your own time so long as they are completed by the dates and times shown in the course schedule.

Important Note: This syllabus, along with course assignments and due dates, are subject to change. The student participant must check our course online site and community for corrections, announcements, or updates to the syllabus. Any changes will be clearly noted in course announcements.

Community Access & Other Assistance

First point of contact will be designated admin officers in each university. For further clarification on these officers, see the google doc link for names and contact details. The second point of contact will be to reach out via email to pkdtraining@biotlabs.africa, response time is within 24 hours.

Part 2: Student Learning Outcomes & Objectives

Student Learning Outcomes

- Understanding Polkadot basics, importance, comparison to other platforms, etc

- Getting started with Rust language and fully utilizing ink! in writing smart contracts, calling, troubleshooting, etc.
- Creating your own blockchain, launching nodes and removing nodes.
- Understanding the concept of Parachains and Substrates on Polkadot
- Creating decentralized applications on Polkadot, build their own parachains and more during the learn and hack sessions.

Course Objectives

- Students will gain knowledge on a general overview of the Polkadot network and applications
- Students will have hands-on experience building blockchains (parachains)
- Students will have first-hand experience coding smart contracts using ink!

You will meet the outcomes listed above through a combination of the following activities in this course:

- Attend all classes, rewatch recorded sessions and follow the instructions
- Complete all assessments and further read suggested materials.
- Participate in all class activities and group works

Part 3: Topic Outline/Schedule

Important Note: Refer to the course calendar for specific meeting dates and times. Activity and assignment details will be explained in detail within each week's corresponding learning module. If you have any questions, please contact your instructor.

Week 01:

Topic: Polkadot Basics

Description: Polkadot is a network of interoperable but independent blockchains that share security built in a way that is different from most other blockchains. This module provides the necessary beginners training and understanding of Polkadot, its features, strengths, wallets, consensus, staking, etc.

Course Outline:

1. What is Polkadot, its features, Relay chains, parachains, and substrates?
 2. Creating an account, types of assets, staking, etc.
 3. Availability and Validity
 4. SPREE
 5. Randomness and Proxy account
 6. Staking
 7. Cryptography and Keys
 8. Polkadot as a layer 0
 9. Architecture and network
 10. Substrates and ease of blockchain enhancement explained
 11. State transition and storage etc.
- **ASSESSMENTS**

Week 02-03:

Topic: Rust language training Modules.

Description: Rust as a language offers zero-cost abstractions and assumes the best practice design and development guidelines as defaults. The majority of the new and scalable blockchains today are built with Rust. This module provides the training required to understand and code with Rust.

Course Outline:

- (1) Basics
- (2) Structs, Enums and Matching
 - Defining and instantiating structs
 - Method syntax
 - Defining an Enum
 - The match Control Flow Construct, etc.
- (3) Filesystem and Processes
- (4) Modules and Cargo
- (5) Standard Library Containers
- (6) Error Handling
- (7) Threads, Networking and Sharing
- (8) Object-Oriented Programming
- (9) Parsing with Nom

Week 04-05: Learn and Hack

Learn and Hack method commences here. Each participant are already teamed and projects are allocated. At the end of every session, they will be able to properly query the knowledge base to properly develop their projects.

Topic: Ink! and Smart contract on Polkadot

Description: Ink! was built to allow developers to write smart contracts in Rust. Targeting blockchains built by Substrate (contract pallets). ink! is a programming language, specifically, it is an embedded domain-specific language (eDSL) for the popular Rust programming language. While the relay chain on the core network manages the security, Parachains however have functionalities built into them, and smart contracts are then built on these parachains using ink!. This module provides the training required to work with ink! Programming language as a smart contract developer on the Polkadot blockchain.

Course Outline:

1. How ink! works from the contract to pallets.
2. Creating and deploying your first contract
3. Calling your contract
 - cross-contract calling;
 - testing;
 - upgradeable contract;
 - and troubleshooting.
 - Metadata
 - Storing and reading values etc.
4. Merging Attributes;
 - Storage and Data structures;
 - Cargo-contract;
 - live testnet using ROC

Week 06-07:

Topic: Building parachains using Substrate

Description: We live in the age of plug-and-play technology where building a blockchain is simple. The substrate is a modular, flexible, extensible framework for building blockchains allowing you to use battle-tested libraries while developing your custom components. This module provides the training required to build your flexible blockchain using pallets etc. as a Parachain on the Polkadot network.

Course Outline:

1. Introduction (Parachains on Polkadot, Anatomy of substrate node, creating your own modules for chain functionality optimization,
2. Building your own blockchain and running nodes.
 - Build a local blockchain
 - Simulate a network
 - Add trusted nodes
 - Authorize specific nodes
 - Monitor node metrics
3. Working with substrate pallet; Innovating with FRAME; using Substrate template node: <https://playground.substrate.dev/>
4. Develop smart contracts, connect relay and parachains, integrate a light client node, and access EVM accounts.
5. Setting up a Parachain (Step by Step)
 - Writing runtime logic; Building the Wasm executable; getting the code validated etc.
 - Testing and Deploying the Parachain (Using Rococo testnet and parachain auction slot)
 - Parachains on Kusama (options for testing enterprise solutions etc.)
 - **Assessment (Building simple applications)**

Part 4: Assessment and Grading Policy

Assessments

All assessments are administered at the end of the weeks training modules. The trainees are divided into groups and assessments are administered to each group. This is to facilitate collaboration and socialized learning providing avenues for group learning. No one is left behind.

Late Work Policy

Be sure to pay close attention to deadlines—there will be no make-up assessments or quizzes, or late work accepted without a serious and compelling reason and instructor approval.

Viewing Grades

Points received by each group for graded activities will be posted to the Grade Board visible to all. Your instructor will update the online grades each time a grading session has been completed. The grades may follow the below template as each instructor will declare his/her

methods and offers encouragement to improve against the next modules and assessment.

Letter Grade	Percentage	Performance
A	90-100%	Excellent Work
B	80-89%	Good Work
C	70-79%	Average Work
D	60-69%	Poor Work
F	0-59%	Failing Work

Part 5: Course Policies

Participation

Students are expected to participate in all online and in-person activities as listed on the course calendar. Sessions are also recorded and documented online for rewatching in spare time. This is under no circumstances allowed to be watched during live class sessions.

Build Rapport

The Bootcamp and assessments are designed in such a way as to facilitate group and social learning ensuring no one is left behind. The online communities are also a tool to ensure the instructors and trainees build rapport even outside of the training hours. If however, you find that you have any trouble keeping up with assignments or other aspects of the course, make sure you let your instructor know as early as possible. As you will find, building rapport and effective relationships are key to becoming an effective professional. Make sure that you are proactive in informing your instructor when difficulties arise.

Complete Assessments

All assessments for this course will be submitted electronically unless otherwise instructed. Assignments must be submitted by the given deadline or special permission must be requested from the instructor *before the due date*. Extensions will not be given beyond the next assignment except under extreme circumstances.