EPAM Data Analytics Engineering Program

Computer Science

- **Computer Hardware Basics:** Desktop Computer Components; Laptop Computer Components; Module Quiz.
- **Data Representation & Computer Architecture:** Number Bases a Bit, a Byte; Negative Numbers; Boolean Algebra; Logic Gates and Circuits; Fetch-Execute Cycle; Text, Encodings; Unicode; Colors and Images; Module Quiz.
- **Formal Languages:** Finite State Machine; Regular Expressions
- **Operating Systems:** OS Concept; Windows: Command Line; Windows: Processes; Windows: Services; Windows: Users and Groups; Windows: Environment Variables; Linux: Shell; Linux: File System; Linux: Users and Groups; Linux: Environment Variables; Module Quiz.
- **Network and Protocols:** Network Concept; OSI/TCP Model; IP, DNS, URL; HTTP; Networking Command; Module Quiz.
- **Databases:** Information Storages; SQL Commands; Module Quiz.
- **Security:** Passwords; Secure Communications; TLS; Module Quiz.
- **Productivity Tools:** Hotkeys; Virtualization and Remote Machines; Cloud; Backups; Version Control; Module Quiz.
- **Additional Topics:** Information Search; Software Licenses; Client-Server Model; Introduction to DevOps; Module Quiz.

Math for IT

- **Functions:** Definition of a Function. Determining Whether a Relationship is a Function; Function Notation; Evaluating and Solving Functions; Notations for the Domain and Range of a Function; Finding the Domain and Range of a Function; Piecewise Functions; Module Quiz.
- **Composition of Functions:** Definition of a Composite Function; Evaluating a Composite Function; Domain of a Composite Function; Decomposition of a Composite Function; Module Quiz.
- **Matrices and Operations:** Matrices; Addition, Subtraction, and Scalar Multiplication; Matrix Multiplication and Transpose; Augmented Matrix; Inverse and Identity Matrices; The Determinant of a Matrix; Module Quiz.
- **Big O Notation:** Big O Notation; Related Asymptotic Notations; Asymptotic Notations and Limits; Module Quiz.
- **Recursive Functions:** Recursively Defined Functions; Closed Forms of Recursively Defined Functions; Module Quiz.
- **Introduction to Probability Theory:** Basic Terminology; Independent and Disjoint Events; Multiplication and Addition Rules; Module Quiz.
- **Combinatorics:** Additive and Multiplicative Principles; Permutations; Combinations and the Binomial Theorem; Pascal's Triangle and Pascal's Identity; Permutations and Combinations with Repetition; Module Quiz.
- **Graph Theory:** Definitions; Trees; Euler Paths and Circuits; Hamilton Paths and Cycles; Directed Graphs; The Shortest Path Problem; Module Quiz.

Programming

- **Introduction to Programming:** Software Programming; Programming Languages; How a Computer Processes a Program: Interpretation, Compilation; Development Environment; Module Quiz.
- **Data Types:** Symbols and Words; The Structure of a Simple Program; Basic Data Types; Variables; Input and Output; Module Quiz.
- **Operators, Expressions:** Arithmetic and Assignment Operators; Typing and Type Conversion; Relational and Logical Operators; Bitwise Logical and Other Operators; Operators Precedence; Module Quiz.
- **Basic Statements in Programming:** Selection Statements; Iteration Statements; Loop Control Statements; Module Quiz.
- **Algorithm Design and Modern Software Development Process Models:** Modern Software Development Process Models; The Concept of an Algorithm; Types of Algorithms; Drawing Linear, Branching, and Looping Algorithms; Module Quiz.
- **Functions:** Function Prototypes. Basics of Functional Programming; Passing Parameters. Local and Global Variables; Functions for Working with Strings; Recursions; Module Quiz.
- **Structured Types/Dynamic Data Structures:** Array. Passing Arrays; Structures, Union, Enum in C; Lists. Stack. Queue. Binary tree; Module Quiz.
- **Sorting Methods:** Big O Notation; Binary Search; Search in Array; Different Sorts; Module Quiz.
- **Files:** Introduction to Files; Opening - Closing a File; Functions for Writing to or Reading Data from a File; Module Quiz.
- **Introduction to Object-Oriented Programming:** Classes and Objects in OOP; Principles of OOP; Composition, Aggregation, and Association; Module Quiz.

Python Core

- **Meet Python:** Types of Programming Languages; Introduction to Python; Interactive Python.
- **Development Environment:** Python Installation; PyCharm Installation; Git Installation and Configuration; GitLab; Performing Practical Tasks; Debugging Python Application.
- **Data Types:** Data Types Overview; Numbers; Practical Tasks: Numbers; Boolean and Comparison Operator; Loops; Strings; Practical Task: Strings; Lists; Practical Task: Lists; Tuples; Practical Task: Tuples; Sets; Dictionaries; Practical Task: Dict; Final Practical Task.
- **Functions:** Functions Arguments; Practical Task: Arguments; Design Concept; Lambda Functions; Recursions; Practical Task: Recursions; Namespaces; Scopes; Closure; Decorators; Practical Task: Decorators; Final Practical Task.
- **Modules and Packages:** Modules; Packages; Import Pitfalls; Quiz.
- **OOP in Python:** OOP Basics; Practical Task: OOP Basics; Class-Related Decorators; Practical Task: Decorators; Exceptions; Practical Task: Exceptions; Magic Methods; Practical Task: Magic Methods; Final Practical Task.
- **Final Assessment:** Timed Exam Final Quiz; Final Practical Task.

Database and SQL

- **DataBase:** Data. DB. DBMS; DB Components; DB Modeling; Normalization; Test.
- **DML SELECT Statement:** Transaction; SQL Statements; PostgreSQL; SELECT Statement; JOIN Types; Aggregation; Subqueries; CTE; Set Operations; Steps to write query; Test.
- **TCL, DML Statements:** TCL Statements; DML: INSERT Statement; DML: UPDATE Statement; DML: DELETE & TRUNCATE Statements; Test.
- **DDL Statements:** DDL Statements; CREATE TABLE; Snapshot vs VIEW; ALTER; DROP; Test.
- **DDL: CREATE FUNCTION:** CREATE FUNCTION; SQL vs PLpgsql; SQL; PLpgsql; Test.
- **DCL Statements:** DCL Statements; Test.
- **OLAP vs OLTP:** OLAP vs OLTP; Intro to DWH; Test.
- **Window Functions:** Window Functions; Aggregate Window Functions; Ranking Window Functions; Offset Window Functions; Test.
- **Window Frames:** Window Frames; UNBOUNDED PRECEDING/ FOLLOWING; offset PRECEDING/FOLLOWING; Frame Exclusion; Examples; NTH_VALUE Function; Test.

Git

- Version Control concept: VCS concept; Version control types; Why Git Download; install and configure git.
- GitHub: Create a github repo and clone it; Pull from remote
- Git graphical tools: Git Gui & gitk
- Git internals: Inside .git folder.
- Undoing changes: Undoing changes; Git reset; Git revert; .gitignore.
- Branching and merge: Branching and merge; Conflict solving; Rebase; Cherry-pick.
- Tags: Tags; Stash; Stashing; Remotes.
- Branching strategies: Branching strategies
- Practical tasks.

Software Development Models and Methodologies

- Concept.
- Waterfall.
- Agile.
- Scrum.
- Kanban.
- Extreme Programming.
- Test-Driven Development.
- Behaviour-Driven Development.

Cloud Overview

- Cloud Core Concepts.
- Cloud Service Models.
- Containers and Serverless.
- Cloud Ownership.
- Public Cloud Platforms Overview.