

ACADEMY | QUANTITATIVE TRADING

Curriculum Guide

Certificate in Quantitative Trading

Three levels of quantitative trading, from the first order to the autonomous system

Quantitative trading, from the first order to the autonomous system.

3 levels | 38 examined modules plus an orientation per level | 8 electives | 150 interview drills

www.quant-atlas.com/academy/trading | Edition November 2026

Contents

1. About the program . . . 3
1.1 The three levels at a glance . . . 3
1.2 How a level is built . . . 3
1.3 Teaching approach . . . 3

2. Who this program is for . . . 4
2.1 What you need before starting . . . 4

3. What you will learn and gain . . . 5
3.1 Level I: How Trading Works . . . 5
3.2 Level II: Trading Strategies . . . 5
3.3 Level III: Microstructure, HFT and Production . . . 5
3.4 What you take away . . . 5

4. Level I: How Trading Works . . . 7
4.1 Core modules . . . 7
4.2 Electives . . . 9
4.3 Practice and assessment . . . 9

5. Level II: Trading Strategies . . . 10
5.1 Core modules . . . 10
5.2 Electives . . . 13
5.3 Practice and assessment . . . 13

6. Level III: Microstructure, HFT and Production . . . 14
6.1 Core modules . . . 14
6.2 Electives . . . 16
6.3 Practice and assessment . . . 16

7. Examinations and the certificate . . . 17
7.1 Official examinations . . . 17
7.2 Certificate requirements . . . 17
7.3 The final project: an autonomous trading strategy . . . 17
7.4 Deliverables . . . 18

8. Interview preparation . . . 19
8.1 What the interview drills are for . . . 19
8.2 Question categories by level . . . 19

9. Roles the certificate targets . . . 20

10. A living curriculum, with permanent access . . . 21
10.1 Continuous updates . . . 21
10.2 Permanent access . . . 21

1. About the program

Three levels covering quantitative trading from A to Z: how markets and orders work, every major strategy family from rules-based and technical to machine learning, statistical arbitrage, options and market making, execution, risk management and sizing, market microstructure, high-frequency trading, and the pipelines that run strategies in production.

The program is organized in three levels. Each level asks one central question, moves through a sequence of modules built on one another, and ends with an official examination. Together, the three examinations and an autonomous-strategy final project lead to the **Certificate in Quantitative Trading**.

1.1 The three levels at a glance

Level	Title and stage	Central question	Modules
I	**How Trading Works** Foundations	*How do markets, orders and trading systems actually work?*	Orientation + 11
II	**Trading Strategies** Systematic	*Which edges exist, and how are they harvested?*	Orientation + 15
III	**Microstructure, HFT and Production** Professional	*How do professional trading operations really run?*	Orientation + 12

1.2 How a level is built

- **Module 0, orientation.** Every level opens with a short orientation that explains what changes at that level, how its modules fit together and why they come in that order. It is not examined.
- **Core modules.** Each examined module is divided into sections. Every section sets out the theory in full, with definitions, derivations and references, then a worked example, figures and applied checks with explained answers.
- **Electives.** Mathematics (shared with the Quant Research program) and Python for Trading at every level, plus Time-Series Econometrics and Low-Latency Programming where they belong. Each has its own progress, is open at any time and is separate from the examination.
- **Practice assessment and interview preparation.** A practice assessment to rehearse the examination, and 50 interview drills per level with model answers.
- **Official examination.** 40 multiple-choice questions on the level's core concepts, with a passing score of 75% (30 of 40).

1.3 Teaching approach

The course teaches trading as it is practiced. Modules are ordered so that each one builds on tools taught before it: each level starts with how the market or the strategy family works, builds the methods needed to trade it, and finishes with a module that turns everything into a system that runs. Every strategy family is taught with its economic source and its failure mode, and the mistakes that make backtests lie (look-ahead, survivorship, data snooping, impossible fills, ignored costs, regime dependence) are taught explicitly rather than left for the reader to discover.

2. Who this program is for

The program is written for anyone who wants to design, test, execute and operate systematic trading strategies. It suits readers who are entering the field as well as practitioners who want to automate and professionalize what they already do.

Reader	What the program offers
Students and graduates	A structured route from market mechanics to production trading systems, with interview drills aligned to each stage.
Discretionary traders	A way to turn rules into code, test them honestly against costs and regimes, and size and risk-manage them systematically.
Developers and engineers	The trading knowledge behind the systems: order types, microstructure, execution algorithms, latency and the operation of a strategy in production.
Aspiring quantitative traders and researchers	Every major strategy family, from trend and carry to statistical arbitrage, options and market making, with the validation methods a desk applies before capital is allocated.
Risk and operations professionals	Position sizing, risk limits, kill switches, monitoring, reconciliation and the operational risks of automated trading.

2.1 What you need before starting

- Familiarity with basic arithmetic, percentages and algebra is useful. No prior Academy level is needed for Level I.
- Python is used throughout. The Python for Trading elective is the on-ramp for students who have not programmed before.
- No real money is needed: every exercise and the final project run on data and a broker paper account.

3. What you will learn and gain

Each level develops one professional competence. The objectives below are the ones the level is built and examined around.

3.1 Level I: How Trading Works

> **Competence.** From instruments and order books to data, performance measurement, backtesting, sizing and risk, ending with a first strategy that runs on its own against a paper account.

- Explain how an order travels from a strategy to an exchange and back.
- Measure a strategy's performance and risk without being misled by the metrics.
- Build an honest backtest and recognize the traps that make one lie.
- Size positions and control risk with simple, robust rules.
- Run a first automated strategy end to end on a paper account.

3.2 Level II: Trading Strategies

> **Competence.** The whole spectrum of systematic strategies: trend, momentum and factors, statistical arbitrage and arbitrage, carry, events, volatility and options, machine learning, crypto, execution algorithms, advanced sizing and risk, portfolios of strategies and robust validation.

- Build and evaluate each major family of systematic strategy.
- Explain the economic source and the failure mode of every strategy family.
- Apply machine learning to trading without fooling yourself.
- Execute large orders with algorithms and measure their cost.
- Size, combine and risk-manage a portfolio of strategies.
- Validate a strategy with walk-forward, purged cross-validation and deflated Sharpe ratios.

3.3 Level III: Microstructure, HFT and Production

> **Competence.** Market microstructure, the limit order book, market making and high-frequency trading in full detail, then trading system architecture, production pipelines, real-time risk controls, live monitoring, capacity and the failures that define the field. Ends with the autonomous strategy project.

- Explain how prices form and spreads arise from the main microstructure models.
- Model the limit order book and build market-making strategies.
- Describe HFT strategies and the infrastructure that runs them.
- Design a production trading system and its pipelines.
- Control risk in real time and decide when to switch a strategy off.
- Run an autonomous strategy and report its results honestly.

3.4 What you take away

- A working toolkit for building, testing, executing and operating systematic strategies, from a single order to a strategy that runs unattended.

- The habit of separating an edge from a backtest artifact, gross from net performance, and a good strategy from a lucky one.
- Practice writing pre-registered protocols and reports in which every number reconciles to the trade ledger.
- On completing every requirement, the Certificate in Quantitative Trading.

4. Level I: How Trading Works

> **Foundations level.** *How do markets, orders and trading systems actually work?*

From instruments and order books to data, performance measurement, backtesting, sizing and risk, ending with a first strategy that runs on its own against a paper account.

No prior Academy level is required. Basic mathematical familiarity is useful.

4.1 Core modules

No.	Module and what it introduces
0	**Start Here: What Quantitative Trading Is** Quantitative trading turns a rule about markets into code that decides what to buy, sell, how much and when, and then runs it. This orientation explains what the field covers, who works in it, how the three levels fit together and what you need to study them. **Sections:** What quantitative trading is; Who does what in a trading operation; How the program is organized; What you need to study. *Orientation, not examined.*
1	**Markets and Instruments** Every strategy trades an instrument, and each instrument has its own mechanics: how it is quoted, what it costs to hold, how much leverage it allows and how it can go wrong. This module covers the instruments used throughout the program and the details that most often surprise new traders. **Key topics:** Equities and ETFs; Futures and margin; Foreign exchange; Options basics; Crypto spot and perpetuals; Shorting, borrow and settlement **You will be able to:** Explain how equities, ETFs, futures, FX, options and crypto perpetuals are quoted and traded. Compute notional exposure, margin and leverage for a futures position.
2	**How a Trade Happens** Between a strategy's decision and a filled order there is a chain of venues, rules and intermediaries. Each one affects the price you get. This module follows an order through that chain: order types, the limit order book, auctions, brokers and routing, fees and rebates, and the venues where trading happens out of sight. **Key topics:** Exchanges and venues; Order types; The limit order book; Opening and closing auctions; Brokers, routing and fees; Dark pools and internalization **You will be able to:** Choose the right order type for a trading decision and explain its risks. Read a limit order book and compute the cost of crossing the spread.
3	**Data for Trading** A strategy is only as good as the data it was tested on. Prices need adjusting for splits and dividends, futures need stitching across expiries, timestamps need to mean what you think they mean, and the universe must include the assets that later disappeared. **Key topics:** Bars, ticks and quotes; Corporate actions and adjustment; Continuous futures; Timestamps and time zones; Survivorship and point-in-time data; Vendors and data quality **You will be able to:** Choose between bars, ticks and quotes for a given strategy. Adjust prices for corporate actions and build continuous futures series.

No.	Module and what it introduces
4	**Measuring Performance** Every strategy is judged by numbers: return, volatility, drawdown, Sharpe ratio, hit rate. Each number answers a specific question and each can mislead. This module defines the standard measures, shows how to compute them correctly and explains where they hide risk. **Key topics:** Simple and log returns; Volatility and drawdown; Sharpe, Sortino and Calmar; Hit rate, payoff ratio and expectancy; Turnover and holding period; How metrics mislead **You will be able to:** Compute simple and log returns and aggregate them correctly over time. Calculate volatility, drawdown and the Sharpe, Sortino and Calmar ratios.
5	**Anatomy of a Trading Strategy** Every trading strategy, from a moving-average rule to a high-frequency market maker, is built from the same parts: a signal, rules to enter and exit, a sizing rule, risk limits and an execution method. **Key topics:** Signal and forecast; Entry and exit rules; Sizing and risk; Execution; Strategy families; Edge: where returns come from **You will be able to:** Decompose any strategy into signal, entry, exit, sizing, risk and execution. Classify strategies into families and name the source of return each one relies on.
6	**Backtesting** A backtest simulates how a strategy would have traded in the past. Done well, it is the cheapest way to reject bad ideas; done badly, it is a machine for producing false confidence. **Key topics:** The backtest loop; Vectorized backtests; Event-driven backtests; Fill models; Costs and slippage; Building a backtester **You will be able to:** Describe the backtest loop and the information each step may use. Choose between vectorized and event-driven backtests.
7	**Backtest Traps** Most backtests that look excellent are wrong. The errors are rarely exotic: the strategy saw the future, tested only survivors, was chosen from hundreds of variations, traded at prices that were never available, ignored costs, or happened to be tested in one favourable regime. **Key topics:** Look-ahead bias; Survivorship bias; Data snooping and overfitting; Impossible fills; Ignored costs; Regime dependence **You will be able to:** Recognize look-ahead, survivorship, data-snooping, fill, cost and regime traps in a backtest. Estimate how much a trap can inflate a result.
8	**Technical and Rules-Based Trading** Technical and rules-based strategies decide from prices and volumes alone. They are the oldest systematic strategies and still the most widely used. **Key topics:** Moving-average rules; Breakout and channel rules; Oscillators and mean reversion; Volatility filters; Testing technical rules; The academic evidence **You will be able to:** Write moving-average, breakout and oscillator rules precisely enough to backtest. Test a technical rule without snooping, and interpret the results.
9	**Position Sizing** Two traders with the same signal can end with opposite results because they sized differently. Sizing decides how much of the edge you capture and whether you survive the losing streaks. **Key topics:** Fixed and fixed-fractional sizing; Volatility targeting; The Kelly criterion; Fractional Kelly; Risk of ruin; Sizing with costs **You will be able to:** Size positions with fixed-fractional and volatility-targeting rules. Compute the Kelly fraction for a simple bet and for a continuous strategy, and explain why fractional Kelly is used.

No.	Module and what it introduces
10	**Risk Management Fundamentals** Sizing decides how much to bet on each trade; risk management decides how much can be lost in total, and what happens when things go wrong. **Key topics:** What risk management is for; Stop-losses and their evidence; Exposure and leverage limits; Correlation and concentration; Drawdown rules; A written risk plan **You will be able to:** Explain the purposes of risk management beyond limiting losses. Use stops, exposure limits and drawdown rules where they help, and know when they hurt.
11	**Your First Automated Strategy** This module puts Level I together: a simple strategy that runs on its own, from data to orders to a reconciled ledger, on a broker paper account. It covers broker APIs, paper trading and its limits, order handling and state, scheduling, logging and monitoring, and the steps of a first end-to-end run. **Key topics:** Broker APIs; Paper trading; Order handling and state; Scheduling; Logging and monitoring; A first strategy end to end **You will be able to:** Connect a strategy to a broker API and a paper account. Handle orders, fills and state so the strategy survives restarts and errors.

4.2 Electives

Optional tracks that develop supporting skills at this level. Each has its own progress and can be studied at any time; electives do not affect examination eligibility.

No.	Elective	What it covers
E1	**Math I: Foundations & Linear Algebra** Mathematics (shared with Quant Research)	Shared with the Quant Research program: the same Math elective, studied at the matching level. **Topics:** Percentages, logs and growth; Summation and weighted averages; Vectors and matrices; Covariance and portfolio risk; Mental math
E2	**Python for Trading I** Python	Python from zero for traders: data structures, pandas for prices, vectorized signals and a first backtest. **Topics:** Python basics; pandas for price data; Vectorized signals; Plotting; A first backtest; Reading broker data

4.3 Practice and assessment

- Quick checks with explained answers in every section of every module.
- A practice assessment to rehearse the official examination.
- 50 interview drills with model answers, open from the day you enroll.
- The official Level I examination: 40 multiple-choice questions, pass mark 75%.

5. Level II: Trading Strategies

> **Systematic level.** *Which edges exist, and how are they harvested?*

The whole spectrum of systematic strategies: trend, momentum and factors, statistical arbitrage and arbitrage, carry, events, volatility and options, machine learning, crypto, execution algorithms, advanced sizing and risk, portfolios of strategies and robust validation.

Level II is open to Level I students and to students of the complete program. Its examination requires a pass in the Level I examination.

5.1 Core modules

No.	Module and what it introduces
0	**Start Here: The Strategy Landscape** Level I explained how trading works. Level II covers the strategies: what edges exist, where they come from, how to build and trade them, how they fail, and how to size, combine, execute and validate them. This orientation maps the fifteen modules and explains how to study them. **Sections:** The strategy map; Data and tools for Level II; How Level II is assessed. *Orientation, not examined.*
1	**Trend Following** Trend following buys markets that have been rising and sells markets that have been falling, across many asset classes. It is one of the oldest systematic strategies, with evidence going back more than a century, and it is the core of the managed futures industry. **Key topics:** Time-series momentum; Trend signals; Volatility scaling; Diversified futures portfolios; Crisis alpha; Drawdowns and patience **You will be able to:** Construct a time-series momentum signal and a volatility-scaled position. Build a diversified trend-following portfolio across futures markets.
2	**Momentum and Factor Trading** Cross-sectional strategies rank many assets against each other and buy the best while selling the worst. Momentum, value, quality and low volatility are the most studied. **Key topics:** Cross-sectional momentum; Momentum crashes; Value, quality and low volatility; Long-short construction; Factor timing; Costs and capacity **You will be able to:** Build cross-sectional momentum and value portfolios, including the skip month and neutralization. Explain momentum crashes and how volatility management reduces them.
3	**Statistical Arbitrage** Statistical arbitrage bets that prices of related assets, after drifting apart, will move back together. It ranges from trading one pair of similar stocks to running hundreds of positions against a statistical model of the whole market. **Key topics:** Pairs trading; Cointegration; Ornstein-Uhlenbeck spreads; PCA residuals; Kalman filter hedge ratios; When spreads do not converge **You will be able to:** Select and trade pairs with distance and cointegration methods. Model a spread as a mean-reverting process and compute its half-life.

No.	Module and what it introduces
4	**Arbitrage Strategies** Arbitrage strategies trade the price difference between instruments that are linked by a contract or a corporate event: a future and its underlying, an ETF and its basket, a takeover target and its offer price, a convertible bond and its stock. The link makes the trade look riskless. **Key topics:** Index and ETF arbitrage; Cash-and-carry basis; Merger arbitrage; Convertible arbitrage; Limits to arbitrage; Funding and margin **You will be able to:** Price a futures contract from its underlying and identify index and basis arbitrage opportunities. Value a merger arbitrage position and infer the market's implied probability of completion.
5	**Carry and Term Structure** Carry is the return an asset earns if its price does not change: the interest-rate difference in currencies, the roll yield in futures, the yield and roll-down in bonds. Carry strategies hold high-carry assets and short low-carry ones. They earn steady returns most of the time and suffer sharp crashes. **Key topics:** FX carry; Futures roll yield; Curve and calendar spreads; Carry across asset classes; Carry crashes; Combining carry with trend **You will be able to:** Compute carry for currencies, commodity futures and bonds. Explain why carry earns a return and why it crashes.
6	**Event-Driven and Calendar Trading** Event-driven strategies trade around specific, identifiable moments: earnings announcements, index changes, central bank meetings, economic releases and recurring points in the calendar. **Key topics:** Post-earnings drift; Index inclusion and rebalancing; Macro releases; Seasonality and calendar effects; Event studies for trading; Event data and timing **You will be able to:** Construct a post-earnings drift strategy from earnings surprises. Explain index rebalancing and macro-announcement effects and how they have changed.
7	**Volatility and Options Trading** Options let traders bet on volatility rather than direction. Volatility strategies trade the difference between the volatility priced into options and the volatility that actually occurs. The best-documented one, selling volatility to earn the variance risk premium, is also among the most dangerous. **Key topics:** Implied and realized volatility; The variance risk premium; Delta hedging; Gamma scalping; Skew and dispersion; Short-volatility blow-ups **You will be able to:** Compute realized volatility and compare it with implied volatility. Explain the P&L of a delta-hedged option in terms of gamma and the gap between realized and implied volatility.
8	**Machine Learning for Trading I** Machine learning can find patterns that simple rules miss, and it can find patterns that do not exist with even greater ease. **Key topics:** Features for trading; Labeling; The triple barrier; Meta-labeling; Tree ensembles; Purged cross-validation **You will be able to:** Engineer stationary, point-in-time features and labels aligned with trading decisions. Apply the triple barrier method and meta-labeling.
9	**Machine Learning for Trading II** The second ML module covers the methods that attract the most attention: deep sequence models, reinforcement learning, natural language processing, alternative data and large language models. Each can add value in the right place, and each has a characteristic way of failing that is easy to miss in a backtest. **Key topics:** Sequence models; Reinforcement learning; NLP and sentiment; Alternative data; LLM look-ahead; Why ML fails live **You will be able to:** Judge where sequence models and reinforcement learning can help in trading. Build text-based signals and evaluate alternative datasets.

No.	Module and what it introduces
10	**Crypto and 24/7 Markets** Crypto markets trade around the clock on many independent exchanges, with perpetual futures, high leverage and data that is unusually open. These features create distinctive strategies (funding and basis trades, cross-exchange arbitrage, on-chain signals) and distinctive risks, above all the risk that the exchange itself fails. **Key topics:** Crypto market structure; Perpetuals and funding; Basis and funding trades; Cross-exchange arbitrage; On-chain data; Exchange and custody risk **You will be able to:** Describe crypto market structure and how it differs from traditional markets. Build funding and basis trades and compute their returns and risks.
11	**Execution Algorithms** A strategy's returns are earned on paper and paid away in execution. For large orders, how the order is worked (fast or slow, aggressive or passive, in which venues) can matter as much as the signal. **Key topics:** Why execution matters; TWAP, VWAP and POV; Implementation shortfall; Almgren-Chriss; Market impact; Transaction cost analysis **You will be able to:** Choose between TWAP, VWAP, POV and implementation shortfall algorithms for an order. Explain the trade-off between impact and risk in the Almgren-Chriss model.
12	**Advanced Position Sizing** Level I sized single strategies. Professional books size many positions and strategies at once, with estimated inputs, leverage limits and drawdown constraints. **Key topics:** Kelly with estimation error; Multi-asset Kelly; Portfolio volatility targeting; Risk parity sizing; Drawdown-based scaling; Leverage and margin **You will be able to:** Shrink Kelly sizes for estimation error and compute multi-asset Kelly weights. Size a portfolio by volatility targeting and risk parity.
13	**Advanced Risk Management** Level I's risk management set limits for a single strategy. A professional book needs to measure how much it could lose across all its positions, under normal conditions and under stress, and to plan for the liquidity and funding it would need to survive. **Key topics:** VaR and expected shortfall; Stress tests and scenarios; Correlation in a crisis; Liquidity risk; Tail hedging; Margin and funding risk **You will be able to:** Compute and interpret value at risk and expected shortfall, and know their limits. Design historical, hypothetical and reverse stress tests.
14	**Portfolios of Strategies** Few professional traders run a single strategy. They combine signals within a strategy and strategies within a portfolio, because combination is the most reliable way to raise a Sharpe ratio. **Key topics:** Combining signals; Combining strategies; Allocation methods; Diversification in stress; Capacity; Rebalancing the allocation **You will be able to:** Combine signals and estimate the information coefficient of the combination. Decide whether a new strategy improves a portfolio from its Sharpe ratio and correlation.
15	**Validating Trading Strategies** Level I's backtest traps showed how a backtest can mislead. This module gives the formal tools for deciding whether a strategy's backtest deserves trust: walk-forward analysis, combinatorial purged cross-validation, the deflated Sharpe ratio, the probability of backtest overfitting and parameter stability. **Key topics:** Walk-forward analysis; Combinatorial purged cross-validation; The deflated Sharpe ratio; Probability of backtest overfitting; Parameter stability; A validation checklist **You will be able to:** Run walk-forward and combinatorial purged cross-validation. Compute the deflated Sharpe ratio and interpret the probability of backtest overfitting.

5.2 Electives

Optional tracks that develop supporting skills at this level. Each has its own progress and can be studied at any time; electives do not affect examination eligibility.

No.	Elective	What it covers
E1	**Math II: Calculus I & II** Mathematics (shared with Quant Research)	Shared with the Quant Research program: the same Math elective, studied at the matching level. **Topics:** Limits and derivatives; Integrals; Series and approximation; Optimization
E2	**Python for Trading II** Python	Event-driven backtesters, vectorized research at scale, broker APIs and asynchronous data feeds. **Topics:** Event-driven backtester; Performance and vectorization; Broker and data APIs; Async data feeds; Testing trading code; Packaging a strategy
E3	**Time-Series Econometrics** Econometrics	The statistical models behind systematic strategies, with code. **Topics:** Stationarity and unit roots; ARMA models; GARCH volatility; Cointegration tests; Kalman filters; Regime-switching models

5.3 Practice and assessment

- Quick checks with explained answers in every section of every module.
- A practice assessment to rehearse the official examination.
- 50 interview drills with model answers, open from the day you enroll.
- The official Level II examination: 40 multiple-choice questions, pass mark 75%.

6. Level III: Microstructure, HFT and Production

> **Professional level.** *How do professional trading operations really run?*

Market microstructure, the limit order book, market making and high-frequency trading in full detail, then trading system architecture, production pipelines, real-time risk controls, live monitoring, capacity and the failures that define the field. Ends with the autonomous strategy project.

Level III is open to Level II students and to students of the complete program. Its examination requires a pass in the Level II examination.

6.1 Core modules

No.	Module and what it introduces
0	**Start Here: Inside Professional Trading** Level III goes inside professional trading operations. It starts with the theory of how prices form and how order books work, moves through market making and high-frequency trading in full detail, then covers the systems, pipelines, controls and monitoring that keep strategies running, and the failures that define the field. **Sections:** What changes at Level III; The arc of the level; The final project. *Orientation, not examined.*
1	**Market Microstructure Theory** Market microstructure studies how trading mechanisms turn orders into prices. Its models explain why bid-ask spreads exist, why trades move prices, and how information reaches prices through order flow. **Key topics:** The Roll spread; Glosten-Milgrom; Kyle's lambda; Inventory models; Price discovery; Order-flow toxicity **You will be able to:** Estimate an effective spread from price changes with the Roll model. Derive bid and ask prices in the Glosten-Milgrom model and price impact in the Kyle model.
2	**The Limit Order Book** The limit order book is where most modern trading happens. Its rules decide which orders trade first, its state predicts short-term price moves, and its data is the raw material of high-frequency trading. **Key topics:** Matching engines; Priority rules; Queue dynamics; Order flow imbalance; The microprice; Order book data **You will be able to:** Explain how a matching engine processes orders under price-time and pro-rata priority. Model queue position and its effect on fill probability.
3	**Market Making** Market makers quote both sides of the market and earn the spread, while managing the risk of holding inventory and of trading against better-informed traders. **Key topics:** The market maker's problem; Avellaneda-Stoikov; Inventory control; Adverse selection; Fees and rebates; Market making in practice **You will be able to:** Decompose market-making P&L into spread capture, adverse selection and inventory. Compute reservation prices and optimal spreads in the Avellaneda-Stoikov model.
4	**High-Frequency Trading I: Strategies** High-frequency trading (HFT) uses speed and automation to trade very often, hold positions briefly and end most days flat. It provides much of the liquidity in modern markets and competes intensely for tiny, fleeting opportunities. **Key topics:** What HFT is; Latency arbitrage; Cross-venue and ETF arbitrage; Statistical HFT; News and event latency; The economics of speed **You will be able to:** Define high-frequency trading and its distinguishing features. Explain how latency arbitrage, cross-venue arbitrage and statistical HFT strategies work.

No.	Module and what it introduces
5	**High-Frequency Trading II: Infrastructure** In high-frequency trading the infrastructure is the strategy's edge. **Key topics:** Colocation; Microwave and laser links; Kernel bypass networking; FPGAs; Clock synchronization; Low-latency software **You will be able to:** Explain where latency comes from between an exchange event and an order reaching it. Describe colocation, wireless links, kernel bypass and FPGAs and what each saves.
6	**High-Frequency Trading III: Simulation** High-frequency strategies cannot be tested on bars. Their results depend on queue positions, latencies and which orders are filled, all of which a naive backtest gets wrong in the optimistic direction. **Key topics:** Why HFT backtests lie; Market replay; Queue position models; Latency simulation; Fill probability; Validating a simulator **You will be able to:** Identify the assumptions that make high-frequency backtests optimistic. Simulate queue position, latency and fills from order-level data.
7	**Trading System Architecture** A trading system is a set of components that must work together correctly every second the market is open. **Key topics:** System components; Market data handlers; OMS and EMS; The FIX protocol; Event-driven design; State and recovery **You will be able to:** Describe the components of a trading system and the data flowing between them. Implement the order lifecycle as a state machine and read basic FIX messages.
8	**Production Pipelines** Around every live strategy runs a set of pipelines: data arriving and being checked, jobs running on schedule, models being retrained and deployed, monitors watching for problems, reconciliations catching errors, and plans for when infrastructure fails. **Key topics:** Data ingestion; Scheduling; Retraining and deployment; Monitoring and alerting; Reconciliation; Disaster recovery **You will be able to:** Build data ingestion with validation, versioning and handling of late or revised data. Schedule dependent jobs and deploy model changes with shadow runs, canaries and rollback.
9	**Real-Time Risk Controls and Regulation** Automated trading can lose money faster than any human can react. Real-time risk controls are the last line of defence, and regulators require them. **Key topics:** Pre-trade checks; Kill switches; Limits and throttles; SEC Rule 15c3-5; MiFID II RTS 6; Market abuse **You will be able to:** Design pre-trade checks, kill switches, limits and throttles for an automated strategy. Summarize the main requirements of SEC Rule 15c3-5 and MiFID II RTS 6.
10	**Live Monitoring and the Strategy Lifecycle** Once a strategy is live, the question changes from whether it would have worked to whether it is working. Live results always differ from the backtest; the job is to explain the difference, detect genuine decay early without overreacting to noise, and decide on evidence when to scale a strategy down or switch it off. **Key topics:** Live versus backtest; Slippage attribution; Decay detection; Regime change; Switching a strategy off; The strategy lifecycle **You will be able to:** Compare live results with a same-period backtest and attribute the gap. Detect decay with statistical monitoring that accounts for noise.

No.	Module and what it introduces
11	**Capacity, Crowding and Scaling** A strategy that works at one million dollars may fail at one hundred million. Edges decay as more capital pursues them, crowded positions unwind together, and every additional dollar trades against the same limited liquidity. **Key topics:** Alpha decay; Estimating capacity; Crowding; The 2007 quant quake; Multi-strategy platforms; Scaling a book **You will be able to:** Explain alpha decay and estimate a strategy's capacity from its edge and costs. Measure crowding and explain the mechanism of the August 2007 quant quake.
12	**Trading Failures Casebook** Every control in this program exists because someone lost money without it. This casebook studies seven famous failures: Knight Capital, the 2010 Flash Crash, spoofing cases, Long-Term Capital Management, Amaranth, Volmageddon and Archegos. **Key topics:** Knight Capital; The Flash Crash; Spoofing; LTCM; Amaranth; Volmageddon and Archegos **You will be able to:** Explain the mechanism of each failure in the casebook. Identify the controls that would have prevented or limited each one.

6.2 Electives

Optional tracks that develop supporting skills at this level. Each has its own progress and can be studied at any time; electives do not affect examination eligibility.

No.	Elective	What it covers
E1	**Math III: Multivariable Calculus & Stochastic Calculus** Mathematics (shared with Quant Research)	Shared with the Quant Research program: the same Math elective, studied at the matching level. **Topics:** Multivariable calculus; Optimization; Probability; Brownian motion and Itô; Monte Carlo; Tail risk
E2	**Python for Trading III** Python	Production Python: services, scheduling, databases for tick data, monitoring and testing. **Topics:** Services and scheduling; Tick data storage; Monitoring; Testing and CI; Performance profiling; Deployment
E3	**Low-Latency Programming** Low-latency programming	The engineering behind high-frequency trading, in C++ and Rust. **Topics:** Memory and caches; Lock-free queues; Networking and kernel bypass; Measuring latency; C++ for trading; Rust for trading

6.3 Practice and assessment

- Quick checks with explained answers in every section of every module.
- A practice assessment to rehearse the official examination.
- 50 interview drills with model answers, open from the day you enroll.
- The official Level III examination: 40 multiple-choice questions, pass mark 75%.
- The autonomous-strategy final project, reviewed manually (see section 7.3).

7. Examinations and the certificate

Study is flexible; examination and certification are rigorous. You can work through any level you are enrolled in at your own pace, but the examinations follow the order of the levels.

7.1 Official examinations

Item	Rule
Format	40 multiple-choice questions covering the core concepts of the level.
Pass mark	75%, which is at least 30 correct answers out of 40.
Duration	90 minutes as standard. Extended timing (180 minutes) or an untimed accessibility option can be selected before starting.
Feedback	Each first answer is recorded and locked, then explained, so every attempt teaches what to revisit.
Attempts	One initial attempt and 3 standard retakes.
Order	The Level II and Level III examinations each require a pass in the previous level's examination.

7.2 Certificate requirements

- Pass the Level I, Level II and Level III official examinations.
- Pass the final project: an autonomous trading strategy on a broker paper account.
- Study completion, practice assessments and interview drills prepare you, but do not by themselves award a pass or the certificate.

7.3 The final project: an autonomous trading strategy

Build a strategy and the pipeline that runs it unattended on a broker paper account, then show that its risk-adjusted performance is stable and that every reported number reconciles to the trade ledger.

- **Pre-registered protocol.** Universe, data, signal, sizing, risk limits, costs, success criteria and the evaluation schedule, submitted before any testing.
- **Walk-forward development.** Stability is measured as the consistency of the net Sharpe ratio across walk-forward folds, sub-periods and neighbouring parameter values, all net of the stated costs.
- **Locked holdout.** A final period kept untouched during development and evaluated once.
- **Autonomous paper trading.** The full pipeline runs unattended on a broker paper account (for example Alpaca or Interactive Brokers). Assessed on operation: no manual intervention, working risk checks and kill switch, a reconciled ledger and an explained gap between live and simulated results.
- **Final report.** Every metric reconciled to the trade ledger, with the cost assumptions stated and the failures reported alongside the successes.

Assessment criterion	Weight
Protocol and pre-registration	**15%**
Walk-forward stability: net Sharpe consistency across folds, sub-periods and parameters	**25%**
Holdout evaluation and validation: deflated Sharpe ratio, costs, capacity	**15%**

Assessment criterion	Weight
Autonomous operation: unattended runs, risk checks, kill switch, alerts	**20%**
Ledger reconciliation and honest reporting	**25%**

7.4 Deliverables

- The pre-registered protocol, dated before any testing.
- The code repository, with the configuration used and instructions to run it.
- Walk-forward and holdout results, with the research log of every variation tried.
- Paper-trading logs, the broker's statements and the daily reconciliation reports.
- A final report of about 6 to 10 pages, every metric reconciled to the trade ledger.

The forward paper-trading period is assessed on how the system operates, not on its Sharpe ratio: over three months, the standard error of an annualized Sharpe ratio is close to 2, so a short forward period cannot separate a good strategy from a lucky one.

The Certificate in Quantitative Trading is a private, non-accredited educational certificate issued by Quant Atlas Academy. It is not a university degree, regulatory license, or independently accredited professional qualification.

8. Interview preparation

Each level includes 50 interview drills, 150 across the program. They exist for one purpose: to turn what you studied into answers you can give out loud, under pressure, to an interviewer who will push back.

8.1 What the interview drills are for

- **Explaining, not just knowing.** Trading interviews test whether you can reason through a market problem and justify each step. The drills train that explanation.
- **Model answers and reasoning.** Every drill comes with a model response, the reasoning behind it, a follow-up question an interviewer is likely to ask, and the weak answer to avoid.
- **Practice with feedback.** Choice questions give immediate feedback; written and spoken answers use guided self-review.
- **Open from day one.** Interview preparation is available from enrollment, independently of the examination, so you can return to it throughout your study.

8.2 Question categories by level

Level	Categories covered
Level I	Futures, Shorting, Options, Perpetuals, Order types, Order book, Venues, Auctions, Adjustment, Survivorship, Timestamps, Continuous futures, Sharpe ratio, Returns, Drawdown, Expectancy, Costs, Strategy design, Edge, Families, Backtest timing, Fills, Impact, Reconciliation, Overfitting, Look-ahead, Regimes, Audit, Trend rules, Evidence, Mean reversion, True range, Kelly, Volatility targeting, Risk of ruin, Fixed fractional, Stops, Correlation, Leverage, Risk plan, Drawdown rules, Automation, State, Paper trading, Monitoring, ETFs, Dark pools, Vectorized vs event-driven, Fractional Kelly, Concentration.
Level II	Trend following, Diversification, Crisis alpha, Patience, Momentum, Momentum crashes, Combining factors, Neutralization, Cointegration, Half-life, Kalman filter, Broken spreads, Index arbitrage, Merger arbitrage, Limits to arbitrage, FX carry, Roll yield, Carry risk, Earnings drift, Calendar effects, Event studies, Variance risk premium, Delta hedging, Dispersion, Labels, Cross-validation, Meta-labeling, LLM look-ahead, Reinforcement learning, Alternative data, ML failure, Crypto funding, Basis trade, Liquidations, Execution, Almgren-Chriss, Impact, Kelly uncertainty, Risk parity, Margin, VaR vs ES, Stress testing, Liquidity, Adding strategies, Hidden exposure, Capacity, Deflated Sharpe, PBO, Walk-forward, CPCV.
Level III	Spreads, Glosten-Milgrom, Kyle, Roll, Toxicity, Queues, Pro-rata, OFI, Microprice, Data, Avellaneda-Stoikov, Market-making P&L, Inventory, Rebates, Quote withdrawal, HFT definition, Latency arbitrage, Arms race, Statistical HFT, News, Microwave, Kernel bypass, FPGAs, Clocks, Tail latency, Simulation, Queue assumptions, Latency simulation, Validation, Architecture, Feeds, Order lifecycle, FIX, Recovery, Pipelines, Deployment, Reconciliation, Disaster recovery, Pre-trade checks, Kill switch, Rule 15c3-5, RTS 6, Market abuse, Live vs backtest, Decay, Retirement, Capacity, Crowding, 2007, Casebook.

The drills focus on trading mechanics, strategy reasoning, risk and systems. The Python and Low-Latency Programming electives build coding foundations, but they do not replace role-specific coding-interview preparation.

9. Roles the certificate targets

The program is designed around the work done in trading roles across funds, banks, proprietary trading firms and trading-technology teams. The table shows where each part of the curriculum is most directly relevant.

Role	Where the curriculum is most relevant
Quantitative trader	The full program: strategy families, validation and sizing (Level II), microstructure, market making and high-frequency trading (Level III).
Systematic strategy researcher	Level I backtesting and its traps, Level II strategy families, machine learning for trading and robust validation.
Execution trader or algorithm developer	Order types and the limit order book (Level I), execution algorithms and transaction cost analysis (Level II), microstructure and latency (Level III).
Quantitative developer	Broker APIs and a first automated strategy (Level I), data pipelines, production systems, monitoring and the low-latency elective (Level III).
Risk manager or trading operations	Position sizing and risk fundamentals (Level I), advanced risk and portfolios of strategies (Level II), kill switches, monitoring and reconciliation (Level III).
Portfolio manager overseeing systematic strategies	The economic source and failure mode of each strategy family, capacity and costs, and how to tell skill from luck in a track record.

Successful graduates may list the certificate under professional development or certifications, with Quant Atlas Academy as the issuer, and discuss their assessed project in interviews.

> The certificate recognizes educational achievement and assessed trading work. It is not a professional license and does not guarantee employment; hiring depends on your broader skills, experience and the requirements of each role.

10. A living curriculum, with permanent access

Markets and trading technology do not stand still, and neither does this program. The curriculum is maintained and extended over time, and students keep what they enrolled in.

10.1 Continuous updates

- Sections, worked examples, figures, interview drills and electives are added and refined as trading practice and the field evolve.
- Updates to a level are included for every student enrolled in that level.
- New material goes through the same automated checks as the existing course: code exercises are executed and numerical questions are verified before publication.

10.2 Permanent access

- Access to the levels you enroll in is permanent. You can revisit any module, section or interview drill whenever you need it, during your studies and long after.
- A recorded examination pass remains valid when new sections or modules are added. You never lose a pass or have to repeat a completed examination because the curriculum grew.

> **Our aim is access.** We are trying to make quantitative trading knowledge accessible to students and professionals everywhere, not only to those who can attend expensive programs.

www.quant-atlas.com/academy/trading