Advanced Automation and Robotics in Drug Screening Training Course

Professional Development Training Course Outline

Category	Biotechnology and Pharmaceutical Development	**Duration**	10 Days
Base Fee	$4,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

The drug discovery landscape is undergoing a rapid, disruptive transformation driven by Industry 4.0 technologies. Traditional high-throughput screening (HTS) methods are being superseded by fully autonomous laboratory systems that leverage AI-driven robotics and advanced automation. This paradigm shift is crucial for accelerating the discovery of novel therapeutics, managing massive compound libraries, and drastically improving the reproducibility and quality of experimental data. Professionals equipped with the skills to design, implement, and manage these sophisticated self-driving labs are now essential for maintaining a competitive edge in the global pharmaceutical and biotech sectors.

Advanced Automation and Robotics in Drug Screening Training Course provides drug discovery scientists, engineers, and laboratory informatics specialists with the practical expertise needed to transition to these modern workflows. It moves beyond basic automation to focus on collaborative robotics (Cobots), real-time data analytics, and the integration of Machine Learning (ML) for intelligent experimental design. Mastering these digital transformation tools is vital for minimizing R&D cycle times, reducing assay variability, and ensuring cGMP/GLP compliance in an era where data fidelity and speed are paramount to clinical success.

Programme Curriculum

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Course Objectives

1. Master the principles of High-Throughput Screening (HTS) and Ultra-HTS (U-HTS) using fully automated platforms.
2. Design and deploy robust Robotic Workcells for complex, multi-step assay development.
3. Implement and validate high-precision Automated Liquid Handlers and Microplate Logistics systems.
4. Integrate Collaborative Robots (Cobots) safely into existing laboratory environments to enhance human-machine synergy.
5. Utilize Laboratory Information Management Systems (LIMS) and Electronic Lab Notebooks (ELN) for data integrity and regulatory compliance.
6. Apply Machine Learning (ML) algorithms for Hit-Picking Optimization and predictive ADMET profiling.
7. Program and troubleshoot robotic sequence logic using industry-standard automation software.
8. Develop robust Data Pipelines for real-time acquisition and advanced Kinetic Data Analysis.
9. Evaluate and select appropriate Detection Technologies for automated assays.
10. Manage and maintain large-scale Automated Compound Libraries and cryogenic storage systems.
11. Conduct Risk Assessments and ensure adherence to cGMP and GLP standards for validated systems.
12. Explore the architecture and application of Self-Driving Labs and Autonomous Discovery Platforms.
13. Optimize laboratory workflows for significant R&D cycle time reduction and cost-efficiency.

Target Audience

1. Automation & Robotics Engineers
2. High-Throughput Screening (HTS) Scientists and Managers.
3. Laboratory Informatics Specialists
4. Process Development Scientists.
5. Research Scientists.
6. Validation and Quality Assurance (QA/QC) Professionals.
7. R&D Directors and Managers.
8. Lead Medicinal Chemists.

Course Modules

Module 1: Foundations of Laboratory Digital Transformation

- The evolution of drug screening: Manual to Ultra-HTS (U-HTS).

- Defining the Lab of the Future (LoF) and its core components.
- Introduction to the automation hierarchy: Devices, workcells, and integrated systems.
- Key metrics: Throughput, Z'-factor, data quality, and R&D ROI.
- Case Study: Transitioning a mid-sized pharma company from 384-well to 1536-well U-HTS for a kinase assay.

Module 2: Advanced Automated Liquid Handling

- Principles of nanoliter and picoliter dispensing
- Understanding and mitigating sources of error:.
- Calibration and validation of high-precision liquid handlers
- Advanced techniques: Serial dilutions, combination matrix generation, and kinetic dispensing.
- Case Study: Optimizing a challenging low-volume compound transfer to minimize compound use and solvent effects.

Module 3: Robotic Workcell Design & Integration

- Architecture of modern High-Throughput Workcells.
- System integration concepts.
- Principles of gripper design and microplate handling logistics.
- Designing protocols for optimal scheduling and minimizing idle time.
- Case Study: Designing a multi-process workcell for simultaneous primary and counter-screening assays.

Module 4: Collaborative Robotics (Cobots) in the Lab

- Introduction to Cobots.
- Human-Robot Interaction (HRI) safety standards and risk assessment
- Programming and teaching Cobots for flexible, intermittent tasks
- Comparing fixed automation vs. flexible automation for dynamic R&D needs.
- Case Study: Implementing a Cobot system for routine microplate sealing/de-sealing and incubator loading in a shared lab space.

Module 5: Laboratory Informatics and Data Integrity

- Implementing and configuring a Laboratory Information Management System (LIMS) for automated workflows.
- The role of Electronic Lab Notebooks (ELN) in capturing automated data and context.
- Ensuring 21 CFR Part 11 compliance and Audit Trails for automated data capture.
- Data pipelines.
- Case Study: Establishing a digital chain of custody for screened compounds from library to results database.

Module 6: Advanced Screening Detection Technologies

- Theory and application of advanced plate reader technologies.
- High-Content Screening (HCS) and Image-Based Cytometry.
- Integrating mass spectrometry (HT-MS) and label-free technologies with robotics.
- Optimizing detection parameters for maximum sensitivity and throughput.
- Case Study: Automating an HCS assay to identify phenotypes for complex neurological targets.

Module 7: Compound Management Automation

- Design and management of Automated Compound Libraries
- Automated reformatting, cherry-picking, and dissolution of compounds.
- Barcoding, RFID, and sample tracking to ensure zero sample loss.
- Quality control and inventory management strategies for compound stocks.
- Case Study: Setting up a fully automated, high-density cryogenic biobank for long-term sample preservation.

Module 8: Introduction to AI and Machine Learning in Screening

- Fundamentals of Machine Learning (ML).
- Using ML for Predictive Modeling of assay success and compound properties
- Data normalization and outlier detection in large HTS datasets using statistical models.
- Virtual Screening (VS) and how it integrates with physical HTS robotics.
- Case Study: Applying a Neural Network model to filter millions of in silico compounds before wet-lab HTS.

Module 9: Programming and Protocol Optimization

- Introduction to industry-leading automation software
- Developing robust, error-handling protocols and exception management.
- Simulation and Emulation for pre-testing and de-risking new protocols.
- Best practices for version control and documentation of automated methods.
- Case Study: Troubleshooting and resolving a common scheduling deadlock in a complex, multi-robot system.

Module 10: Process Control and Quality Assurance

- Statistical quality control (SQC) for HTS.
- System validation lifecycle.
- Change control management for validated automated systems.
- Designing assays with embedded controls for real-time quality monitoring.
- Case Study: Performing a successful PQ for a new robotic liquid handler to meet a strict CV<5% requirement.

Module 11: Advanced Robotics Kinematics and Maintenance

- Understanding robot kinematics.
- Principles of robot maintenance, calibration, and long-term service planning.
- Sensor technologies and their role in advanced manipulation.
- Integrating external tools and custom end-effectors for novel applications.
- Case Study: Developing a preventative maintenance schedule for an entire automated platform to minimize unexpected downtime.

Module 12: Autonomous Systems and Self-Driving Labs

- Conceptualizing the Self-Driving Lab.
- The role of Automated Experimental Design (DoE) platforms.
- Integration of AI agents for autonomous hypothesis generation and testing.
- Data standards and FAIR principles for AI-driven discovery.
- Case Study: Reviewing a successful implementation of a closed-loop system for materials or catalyst discovery.

Module 13: Safety, Regulations, and Future Trends

- Comprehensive risk assessment in an automated laboratory setting
- Adherence to GxP (GLP/GMP) and OSHA standards for automation.
- Data security and intellectual property protection in networked lab systems.
- Emerging trends: Microfluidics, organ-on-a-chip, and their automation challenges.
- Case Study: Preparing a comprehensive safety audit report for an integrated robotic system prior to use with infectious agents.

Module 14: Automated Assay Development and Optimization

- Strategies for converting manual assays to miniaturized, robotic protocols.
- Determining the optimal plate format for target, scale, and cost.
- Kinetic vs. endpoint assays in an automated environment.
- Dispense sequence optimization and dead-volume minimization.
- Case Study: Automating a cell-based viability assay, moving from bench protocol to validated robotic execution.

Module 15: Capstone Project: End-to-End Workflow Design

- Defining a Target Product Profile (TPP) for a new drug screening campaign.
- Designing the complete end-to-end automated workflow
- Developing the robot programming and scheduling logic.
- Presenting the cost-benefit analysis and Return on Investment (ROI) for the proposed system.
- Case Study: Final project presentation and peer review of a full Drug Lead Identification Campaign design.

Training Methodology

The course employs a highly **interactive, blended learning** approach, balancing theoretical knowledge with significant **hands-on practical application**.

- Virtual Lab Simulation.
- Case-Study Driven Lectures.
- Practical Workshops.
- Expert-Led Discussion.
- Final Capstone Project.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call +254769199797

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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