

NTHRYS

OPC PVT LTD

SECTION • SYN

Gene Synthesis, DNA Assembly & Synthetic Biology

Hands-on wet-lab training in designing and building biological systems — DNA parts and assembly standards, genetic circuit design, metabolic pathway engineering, biosensors and reporter systems, genome engineering and assembly, and design-build-test-learn workflows.

06

CATEGORIES

30

PROTOCOLS

SYN

SECTION ID

2026

EDITION

Categories & Protocols

Section **SYN** spans 6 category streams and 30 bench protocols. Every protocol carries a unique code for enrolment, tracking and certification.

SYN-DA	DNA Parts & Assembly Standards BioBricks, MoClo, Type-IIS & hierarchical assembly	05
SYN-GC	Genetic Circuit Design Logic gates, switches, oscillators & tuning	05
SYN-PW	Metabolic Pathway Engineering Pathway assembly, enzyme balancing & flux tuning	05
SYN-BS	Biosensors & Reporter Systems TF, riboswitch & whole-cell biosensor design	05
SYN-GE	Genome Engineering & Assembly Genome-scale assembly, yeast assembly & integration	05
SYN-TS	Build, Test & Iterate (DBTL) High-throughput build, automation & DBTL cycling	05
TOTAL	All training protocols in section SYN	30

CODE FORMAT

SYN · **GC** · **01**

SYN section

GC category

01 protocol



■ CATEGORY · SYN-DA

DNA Parts & Assembly Standards

BioBricks, MoClo, Type-IIS & hierarchical assembly



PROTOCOLS

CODE

TRAINING PROTOCOL

DESCRIPTION

SYN-DA-01

**Standardised Part Design
(BioBricks)**

Composable part formatting.

SYN-DA-02

**MoClo / Modular Cloning
Standards**

Standardised modular assembly.

SYN-DA-03

Type-IIS Assembly

Scarless one-pot assembly.

SYN-DA-04

Hierarchical Assembly

Multi-level construct building.

SYN-DA-05

**Part Characterisation &
Registries**

Quantified reusable parts.

02

CATEGORY • SYN-GC

Genetic Circuit Design

Logic gates, switches, oscillators & tuning

05

PROTOCOLS

CODE

TRAINING PROTOCOL

DESCRIPTION

SYN-GC-01

Logic-Gate Circuit Construction

AND / OR / NOT circuits.

SYN-GC-02

Toggle Switches & Oscillators

Bistable & dynamic circuits.

SYN-GC-03

Promoter-RBS Tuning

Expression-strength balancing.

SYN-GC-04

Feedback & Feedforward Circuits

Regulatory-loop design.

SYN-GC-05

Circuit Testing & Debugging

Behaviour characterisation.

03

■ CATEGORY · SYN-PW

Metabolic Pathway Engineering

Pathway assembly, enzyme balancing & flux tuning

05

PROTOCOLS

CODE

TRAINING PROTOCOL

DESCRIPTION

SYN-PW-01

Pathway Design & Assembly

Multi-gene pathway building.

SYN-PW-02

Enzyme Selection & Balancing

Step-rate matching.

SYN-PW-03

Operon / Polycistronic Construction

Coordinated expression.

SYN-PW-04

Flux Optimisation

Maximising product yield.

SYN-PW-05

Pathway Refactoring

Rebuilding for controllability.

04

■ CATEGORY · SYN-BS

Biosensors & Reporter Systems

TF, riboswitch & whole-cell biosensor design

05

PROTOCOLS

CODE

TRAINING PROTOCOL

DESCRIPTION

SYN-BS-01

Transcription-Factor Biosensors

Ligand-responsive sensing.

SYN-BS-02

Riboswitch Sensors

RNA-based metabolite sensing.

SYN-BS-03

Whole-Cell Biosensor Construction

Living detection systems.

SYN-BS-04

Output Reporter Engineering

Signal-output design.

SYN-BS-05

Sensor Dynamic-Range Tuning

Sensitivity calibration.



■ CATEGORY · SYN-GE

Genome Engineering & Assembly

Genome-scale assembly, yeast assembly & integration



PROTOCOLS

CODE

TRAINING PROTOCOL

DESCRIPTION

SYN-GE-01

Genome-Scale DNA Assembly

Very-large construct building.

SYN-GE-02

Yeast Assembly (TAR / SwAP-In)

In-yeast large assembly.

SYN-GE-03

Minimal Genome Design

Reduced-genome engineering.

SYN-GE-04

Chromosome Integration

Landing-pad insertion.

SYN-GE-05

Whole-Pathway Genome Integration

Stable pathway insertion.



■ CATEGORY · SYN-TS

Build, Test & Iterate (DBTL)

High-throughput build, automation & DBTL cycling



PROTOCOLS

CODE

TRAINING PROTOCOL

DESCRIPTION

SYN-TS-01

High-Throughput Construct
Build

Parallel assembly at scale.

SYN-TS-02

Automated Assembly
Workflows

Liquid-handler pipelines.

SYN-TS-03

Functional Characterisation

Quantitative behaviour testing.

SYN-TS-04

Design-Build-Test-Learn
Cycling

Iterative optimisation loop.

SYN-TS-05

Strain Performance
Validation

Confirming engineered output.

Design & build biological systems

Every protocol in Section SYN is delivered as hands-on bench training — from standardised DNA parts and circuit construction through pathway engineering, biosensors and genome-scale assembly within a design-build-test-learn loop. Synthetic biology treats DNA as engineerable, composable hardware.

30 protocols

6 categories

SYN section

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