COURSE OVERVIEW HE0381
Antibody Engineering, Phage Display and Immune Repertoire Analysis

Course Title
Antibody Engineering, Phage Display and Immune Repertoire Analysis

Course Date/Venue
September 08-12, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
HE0381

Course Duration/Credits
Five days/2.75 CEUs/27.5 PDHs

Course Description

This practical and highly-interactive course includes real-life case studies where participants will be engaged in a series of interactive small groups and class workshops.

This course is designed to provide participants with a detailed and up-to-date overview of Antibody Engineering, Phage display and Immune Repertoire Analysis. It covers the structure and function of antibodies including the importance of antibodies in food safety and diagnostics; the basics of antibody engineering and the tools and technologies for antibody engineering; the antibody-target interactions and challenges in antibody engineering; the phage display, phage library construction and proper selection of high-affinity antibodies; and the pathogen-specific antibodies, foodborne contaminants and pesticide residues and toxins.

During this interactive course, participants will learn the common issues in library design, panning, non-specific binding and background noise; the basics of B-cell and T-cell repertoires and the role of immune repertoires in pathogen detection; the immune repertoire analysis, agriculture and food safety and data analysis and interpretation; the emerging trends in immune repertoire analysis including humanization and affinity maturation; the antibody-based diagnostic kits and rapid testing for foodborne pathogens; the therapeutic antibodies in agriculture, antibody conjugates and regulatory and ethical considerations; the innovations in phage display technology; and the role in combating antimicrobial resistance and synthetic and computational approaches.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on antibody engineering, phage display and immune repertoire analysis
- Discuss the structure and function of antibodies including the importance of antibodies in food safety and diagnostics
- Explain the basics of antibody engineering and the tools and technologies for antibody engineering
- Recognize antibody-target interactions and challenges in antibody engineering
- Discuss phage display, phage library construction and proper selection of high-affinity antibodies
- Explain the development of pathogen-specific antibodies, detect foodborne contaminants and monitor pesticide residues and toxins
- Identify the common issues in library design and panning including non-specific binding and background noise
- Discuss the basics of B-cell and T-cell repertoires and the role of immune repertoires in pathogen detection
- Carryout techniques for immune repertoire analysis, applications in agriculture and food safety and data analysis and interpretation
- Identify the emerging trends in immune repertoire analysis including humanization and affinity maturation
- Develop antibody-based diagnostic kits and apply rapid testing for foodborne pathogens
- Recognize therapeutic antibodies in agriculture, antibody conjugates and regulatory and ethical considerations
- Discuss the innovations in phage display technology, the role in combating antimicrobial resistance and synthetic and computational approaches

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of antibody engineering, phage display and immune repertoire analysis for researchers and scientists, bioinformaticians and data scientists, biotech/pharma industry professionals, regulatory affairs professionals, laboratory technicians and engineers, clinical researchers and graduate students and postdoctoral fellows.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **2.75 CEUs** (Continuing Education Units) or **27.5 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Fee

US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. John Burnip, EHS, SAC, STS, NEBOSH-ENV, NEBOSH-IGC, NEBOSH-IFC, NEBOSH-PSM, NEBOSH-IOG, TechIOSH, is a **NEBOSH Approved Instructor** and a **Senior HSE Consultant** with over **50 years** of practical **Offshore & Onshore** experience within **Oil**, **Gas**, **Refinery**, **Petrochemical** and **Nuclear** industries. His wide experience covers **NEBOSH** International General Certificate in Occupational Health & **Safety**, **NEBOSH** National Certificate in Construction Health & Safety, **NEBOSH** Certificate in Process Safety Management, **NEBOSH** Environmental Management Certificate, **NEBOSH** Certificate in Fire Safety, **NEBOSH** International Oil & Gas Certificate, **HSSE Audit & Inspection**, **HSSE Management System**, **HSSE Performance & Effectiveness**, **HSSE Emergencies**, **Crisis & Incidents**, Hazardous Materials & Chemicals Handling, **PHA**, **HAZOP**, **HAZID**, **Hazard & Risk Assessment**, **Task Risk Assessment**, **Accident & Incident Investigation**, **Emergency Response Procedures**, Job Safety Analysis (**JSA**), Behavioural Based Safety (**BBS**), Process Safety Management (**PSM**), **Confined Space Entry**, **Fall Protection**, **Work Permit & First Aid**, **Emergency Response**, H_2S, ERP Preparation, Project HSE Management System, Health & Hygiene Inspection, PTW Control, Process Modules Fire & Gas Commissioning, MSDS, Ergonomics, Lockout/Tagout, Fire Safety & Protection, Spill Prevention & Control, **Tower & Scaffold Inspection**, **Scaffolding** Operations, **Scaffolding** Equipment, Bracket Scaffolds, **Scaffolding** Labelling, **Pre-fab Scaffolding**; Erecting, Maintaining & Dismantling **Scaffolding** in accordance with the **British Standards Code of Practice 5973**; **Heavy Lifting** operations, **Safe Mobile Elevating Work Platform**, **Safe Forklift Driving**, **Safe Knuckle Boom**, Cantilevered Hoists, **Offshore** Operations, **Offshore** Construction, Basic **Offshore Safety** Induction & Emergency Training (BOSIET), **Onshore** Fabrication & **Offshore** Pipelaying & Hook-Up, **Crane** Inspection, **Crane** Operations, Oilfield Startup & Operation, Steel Fabrication, **ISO 45001**, OSHA, **ISO 9001**, **ISO 14001**, **OHSAS 18001** and **IMO** (**SOLAS**) Regulations. Mr. Burnip has greatly contributed in upholding the highest possible levels of safety for numerous International Oil & Gas projects, Generation Systems & Platform Revamp, LPG & Gas Compression, Marine, Offshore and Power Plant Construction. Currently, he is the **HSE Advisor** of Solvay wherein he is responsible in planning and implementation of the corporate safety program (OSHA codes).

During Mr. Burnip's long career life, he had successfully carried out numerous projects in **Europe**, **North America**, **South America**, **Southeast Asia**, **Middle East** and the **North Sea**. He had worked for Likpin Dubai, SADRA/DOT, **ZADCO**, **McDermott** International (USA, Qatar, Egypt, India, Oman, Dubai and Abu Dhabi), **PDO**, **Shell**, **ARAMCO**, Salman Field, Leman Offshore Gas Field, GEC, Harland & Wolff PLC Belfast in North Ireland, Howard Doris – Kishorn in Scotland, **Westinghouse** Electric in Brazil and South Korea and **Chevron** Oil in Scotland as the **Commissioning Project Engineer**, **Project & Safety Engineer**, **Estimating Engineer**, **Senior Instrument Engineer**, **Instrument Field Engineer**, **Lead Instrument Engineer**, **Instrument Engineer**, **Engineer**, **Emergency Response Training Manager**, **HSSE Manager**, **HSE Advisor**, **HSE Instructor**, **HSE Supervisor**, **Instrumentation Supervisor**, **Instrumentation Specialist**, **Project Coordinator**, **Instrumentation Technician** and **Tank Farm Instrumentation Technician**.

Mr. Burnip has a **Bachelor's** degree in **Business Studies** from the **Somerset University** (**UK**). He is a **Certified/Registered Tutor** in **NEBOSH Certificate in Environmental Management**, **NEBOSH International General Certificate**, **NEBOSH International Certificate in Fire Safety & Risk Management**, **NEBOSH Process Safety Management Certificate** and **NEBOSH International Oil & Gas Certificate**; a **Certified Safety Auditor** (SAC); a **Certified ISO 45001** Auditor; an **Environmental Health and Safety Management Specialist** on Fall Protection, Elevated Structures, Material Handling, Trenching & Excavations; a Welding Brazing Safety Technician; a **Certified Safety Administrator** (**CSA**) - General Industry; a **Safety Manager/Trainer** – General Industry; a **Petroleum Safety Manager** (**PSM**) - Drilling & Servicing; a **Petroleum Safety Specialist** (**PSS**) - Drilling & Servicing; a **Safety Planning Specialist**; a **Safety Training Specialist**; a **Certified Instructor/Trainer**; a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and further holds a Certificate in **Mechanical Engineering Craft Practice** from the **City & Guilds of London Institute**; a **NEBOSH Level 3** Construction Certificate (UK); and holds a **Cambridge Teaching Certificate**. He is a well-regarded member of the **National Association of Safety Professionals**, the **Association of Cost Engineers** (**UK**), **Institution of Occupational Safety & Health** (**TechIOSH**) and an **Associate Member** of **World Safety Organization**. Further, he has conducted innumerable trainings, workshops and conferences worldwide.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Monday, 08th of September 2025***

0800 – 0830	*Registration & Coffee*
0830 – 0845	*Welcome & Introduction*
0845 – 0900	***PRE-TEST***
0900 - 0930	***Overview of Antibodies & Their Role in Agriculture & Food*** *Structure and Function of Antibodies ● Importance of Antibodies in Food Safety and Diagnostics ● Natural vs Engineered Antibodies ● Applications in Pathogen Detection and Food Quality Control*
0930 – 0945	*Break*
0945 – 1100	***Basics of Antibody Engineering*** *Principles and Goals of Antibody Engineering ● Types of Engineered Antibodies (Monoclonal, Bispecific, Nanobodies) ● Comparison Between Traditional and Engineered Antibodies ● Case Studies from Agriculture and Food Safety*
1100 – 1200	***Tools & Technologies for Antibody Engineering*** *Gene Editing Tools (CRISPR, Homologous Recombination) ● Recombinant DNA Technology Basics ● Expression Systems (Bacterial, Mammalian, Yeast) ● Purification Techniques*
1200 – 1300	*Lunch*
1300 – 1330	***Antibody-Target Interactions*** *Mechanisms of Antigen-Antibody Binding ● Epitope Mapping and Antigenicity Prediction ● Techniques for Measuring Binding Affinity (SPR, ELISA) ● Role in Detecting Food Contaminants*
1330 – 1400	***Challenges in Antibody Engineering*** *Common Issues in Stability and Specificity ● Cost-Effectiveness and Scalability in Agriculture ● Ethical Considerations ● Overcoming Challenges with Modern Solutions*
1400 – 1415	*Break*

1415 - 1450	***Practical Session: Basic Laboratory Techniques*** *Introduction to Pipetting and Sample Handling ● ELISA Setup and Troubleshooting ● Hands-On Demonstration of Antibody Purification Techniques ● Data Analysis and Interpretation*
1450 – 1500	***Recap***
1500	*End of Day One*

Day 2: ***Tuesday, 09th of September 2025***

0800 – 0900	***Phage Display*** *History and Development of Phage Display ● Basic Principles and Components ● Types of Phage Systems (M13, T7, etc.) ● Relevance to Agriculture and Food Diagnostics*
0900 – 0930	***Phage Library Construction*** *Principles of Library Design and Diversity Generation ● Strategies for Library Construction (scFv, Fab, Nanobody) ● Screening Strategies for Pathogen Detection in Food ● Library Quality Assessment*
0930 – 0945	*Break*
0945 – 1100	***Selection of High-Affinity Antibodies*** *Panning Techniques (Solid-Phase, Solution-Phase) ● Selection Against Specific Agricultural Pathogens ● Strategies to Improve Selection Specificity ● Role of Bioinformatics in Selection*
1100 – 1200	***Phage Display for Agriculture & Food Safety*** *Development of Pathogen-Specific Antibodies ● Detection of Foodborne Contaminants (e.g., Salmonella, E. coli) ● Monitoring Pesticide Residues and Toxins ● Examples of Phage Display Products in the Field*
1200 - 1300	*Lunch*
1300 – 1330	***Challenges & Troubleshooting in Phage Display*** *Common Issues in Library Design and Panning ● Non-Specific Binding and Background Noise ● Improving Library Diversity ● Case Study: Problem-Solving in a Food Safety Project*
1330 – 1345	*Break*
1345 – 1450	***Practical Session: Phage Display Workflow*** *Preparing Phage Libraries ● Performing a Panning Experiment ● Plaque Assay and Phage Amplification ● Data Analysis and Quality Control*
1450 – 1500	***Recap***
1500	*End of Day Two*

Day 3: ***Wednesday, 10th of September 2025***

0800 – 0900	***Immune Repertoires*** *Basics of B-Cell and T-Cell Repertoires ● Role of Immune Repertoires in Pathogen Detection ● Technologies for Immune Repertoire Analysis ● Applications in Agricultural and Food-Related Studies*
0900 – 0930	***Techniques for Immune Repertoire Analysis*** *High-Throughput Sequencing (NGS) ● Bioinformatics Pipelines for Immune Repertoire Analysis ● Single-Cell Sequencing for B-Cell Characterization ● PCR-Based Methods*
0930 – 0945	*Break*
0945 – 1100	***Applications in Agriculture & Food Safety*** *Immune Repertoire Analysis for Detecting Zoonotic Pathogens ● Role in Developing Vaccines for Livestock ● Monitoring Disease Outbreaks ● Identifying Novel Antibodies for Diagnostics*

1100 – 1200	***Data Analysis & Interpretation*** *Key Metrics in Immune Repertoire Analysis ● Clonotype Identification and Diversity Metrics ● Tools for Repertoire Visualization and Interpretation ● Troubleshooting Data Quality Issues*
1200 - 1300	*Lunch*
1300 – 1330	***Emerging Trends in Immune Repertoire Analysis*** *Integration with Artificial Intelligence and Machine Learning ● Use of Synthetic Biology for Repertoire Engineering ● Advances in Single-Cell Technologies ● Applications in Predictive Diagnostics*
1330 – 1345	*Break*
1345 – 1450	***Practical Session: Data Analysis*** *Hands-On Analysis of Immune Repertoire Data ● Using Bioinformatics Tools (IMGT, VDJtools, MiXCR) ● Visualizing Repertoire Diversity and Clonotype Distribution ● Case Study Analysis*
1450 – 1500	***Recap***
1500	*End of Day Three*

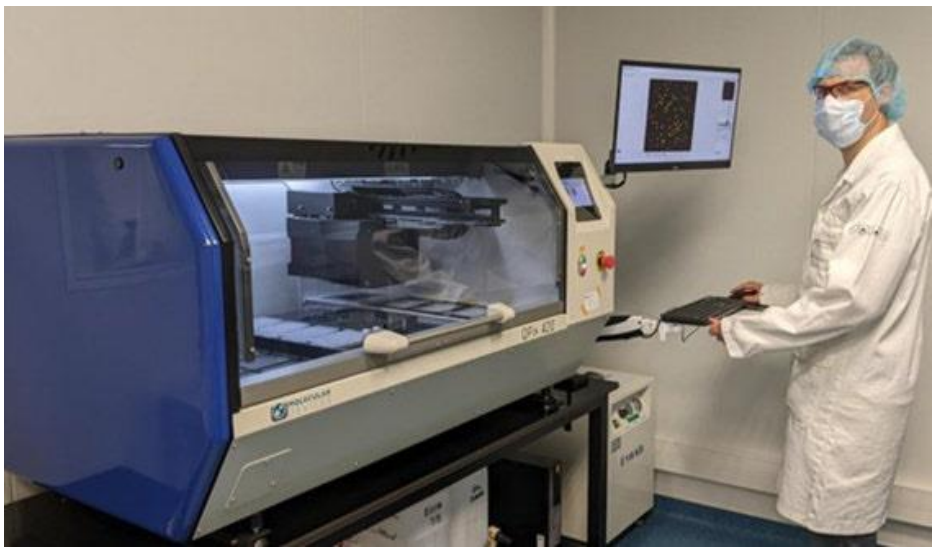
Day 4: ***Thursday, 11th of September 2025***

0800 – 0900	***Humanization & Affinity Maturation*** *Methods for Antibody Humanization ● Directed Evolution for Affinity Maturation ● In Silico Tools for Optimization ● Importance for Cross-Species Applications*
0900 – 0930	***Development of Diagnostic Kits*** *Designing Antibody-Based Diagnostic Kits ● Rapid Testing for Foodborne Pathogens ● Validation and Regulatory Considerations ● Examples of Commercial Diagnostic Kits*
0930 – 0945	*Break*
0945 – 1100	***Therapeutic Antibodies in Agriculture*** *Use of Antibodies for Livestock Health ● Plant Immunity Enhancement Through Antibodies ● Case Studies on Antibody-Based Therapeutics ● Challenges and Solutions*
1100 – 1200	***Antibody Conjugates*** *Antibody-Drug Conjugates (ADCs) for Agriculture ● Enzyme-Linked Antibodies for Food Safety ● Techniques for Conjugation and Validation ● Applications in Residue Detection*
1200 - 1300	*Lunch*
1300 – 1330	***Regulatory & Ethical Considerations*** *Regulatory Requirements for Antibody Products ● Biosafety in Antibody Engineering ● Intellectual Property and Patenting ● Ethical Issues in Agriculture-Specific Antibody Use*
1330 – 1345	*Break*
1345 – 1450	***Practical Session: Advanced Techniques*** *Designing and Testing Antibody Conjugates ● Validation of Diagnostic Assays ● Affinity Testing Using Advanced Instruments ● Troubleshooting Advanced Experiments*
1450 – 1500	***Recap***
1500	*End of Day Four*

Day 5:	***Friday, 12th of September 2025***
0800 – 0930	***Case Studies in Antibody Engineering*** *Successful Examples in Agriculture and Food Safety ● Lessons Learned from Real-World Applications ● Cross-Disciplinary Collaboration Opportunities ● Discussion of Local ADFSA-Related Challenges*
0930 – 0945	*Break*
0945 – 1100	***Future of Phage Display in Agriculture*** *Innovations in Phage Display Technology ● Role in Combating Antimicrobial Resistance ● Integration with Nanotechnology*
1100 – 1200	***Synthetic & Computational Approaches*** *Computational Antibody Design ● Role of AI in Antibody Engineering ● Synthetic Biology Approaches ● Predictive Modeling for Food Safety Applications*
1200 - 1300	*Lunch*
1300 – 1330	***Hands-on Application Development*** *Designing a Diagnostic Workflow for a Local Foodborne Pathogen ● Combining Immune Repertoire Data and Phage Display Outputs ● Testing Diagnostic Sensitivity and Specificity ● Presenting and Critiquing Designs*
1330 – 1345	*Break*
1345 – 1400	***Collaborative Discussions*** *Brainstorming Innovative Ideas ● Identifying Gaps in Current Diagnostic Tools ● Developing a Roadmap for Future Applications ● Group Presentations and Feedback*
1400 – 1515	***Course Conclusion***
1515 – 1530	***POST-TEST***
1530 – 1545	*Presentation of Course Certificates*
1500	*End of Course*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-



Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org