SCHOOL OF LIFE SCIENCES

- Bacterial Staining Techniques
- Recombinant DNA Technology
- DNA Fingerprinting
- Basic Sequence Analysis Using Web-Based Tools
- Beginner Python Programming For Data Analysis

TRAINER'S PROFILE

DR SUNESH KEECHERIL AUGUSTINE

Dr. Sunesh obtained his Ph.D. degree in Microbiology from the University of Pune, India, and did his Post-doctoral research at the Shanghai Jiatong University, Shanghai, P. R. China.

Dr. Sunesh has worked extensively on Actinomycetes and antifungal antibiotics, and has published his research work in peer-reviewed journals. He has more than ten years of full time teaching experience:
• Specialisation: Medical Microbiology, Immunology, Microbial Diversity
• Research area: Actinomycetes, Microbial diversity and Antimicrobial metabolites
• Part of MDIS School of Life Sciences since 2010.

DR RAJARSHI SANKAR RAY

Dr Rajarshi Sankar Ray is a senior lecturer at the MDIS School of Life Sciences. Dr Ray holds a PhD degree (Science) from Jadavpur University, India, awarded in 2006. He has worked in the field of science and education with specialisations in cell biology, molecular biology, cancer and genetics. Before joining the MDIS School of Life Sciences as a full time lecturer in Jan 2010, Dr Ray was actively involved in research, holding positions from Post-Doctoral Research Fellow to Research Associate in the National University of Singapore and later on, in Loyola University Medical Center, Illinois, USA.

He has more than 12 years of teaching experience and 10 years of research experience. He has also published his research work in international peer reviewed journals. Currently, he is teaching the Bachelor of Biomedical Science (Hons) and Bachelor of Biotechnology (Hons) programmes of the Northumbria University, UK, in MDIS.

MAURICE HT LING

Maurice HT Ling is a Research Assistant Professor at the Perdana University School of Data Sciences. He obtained his BSc (Hons) in Molecular and Cell Biology from the University of Melbourne, Australia, in 2004 and a BSc in Computing from the University of Portsmouth, United Kingdom, in 2007. Subsequently, he obtained his Ph.D. in Bioinformatics from the University of Melbourne, Australia, in 2009.

He co-founded Python User Group (Singapore), and was instrumental in inaugurating PyCon Asia-Pacific as one of the three major Python conferences worldwide. In his free time, he likes to read, enjoy a cup of coffee, write in his personal journal and philosophise on various aspects of life. Maurice's portfolio can be accessed at *https://mauriceling.github.io.*

BACTERIAL STAINING TECHNIQUES

Trainer: Dr Sunesh Keecheril Augustine

COURSE SYNOPSIS

Bacterial cells are difficult to be viewed under the microscope unless they are stained. This is due to their lack of colour and contrast. Scientists have been using several types of stains to make these cells visible. The staining procedure help researchers to identify the bacteria, as well as help health care providers to diagnose infections caused by bacteria.

One basic type of staining procedure that can be used is the Simple Stain, where we use just one type of stain, and the bacteria takes up the colour of the stain when observed under the microscope. We get to study the morphology, cell size and arrangement in this type of staining.

To get more information about the bacteria we need to perform a Differential Stain. In this procedure we use more than one stain, and different bacterial cells will take up these stains as per their structural properties. The Gram staining is one of the most commonly used type of Differential stain. This type of staining helps us differentiate between a Gram Positive and Gram Negative bacteria, which is due to their cell wall properties.

Another example is the Endospore staining, where we get to differentiate between the vegetative cells and endospores. These staining techniques will help us in bacterial identification and characterisation.

During this course, you will get to learn more about the above-mentioned types of staining procedures and develop your skills in identifying bacterial characteristics and their potential importance to human health and contamination.

COURSE DATE

September 2020
28 (Mon)

RECOMBINANT DNA TECHNOLOGY

Trainer: Dr Rajarshi Sankar Ray

COURSE SYNOPSIS

Recombinant DNA (rDNA) molecules are DNA molecules formed by laboratory methods of genetic recombination to bring together genetic material from multiple sources, creating sequences that would not otherwise be found in the genome.

Proteins that can result from the expression of recombinant DNA within living cells are termed recombinant proteins. When recombinant DNA encoding a protein is introduced into a host organism, the recombinant protein is not necessarily produced. Expression of foreign proteins requires the use of specialised expression vectors and often necessitates significant restructuring by foreign coding sequences.

Recombinant DNA technology has a diverse range of applications. It has proven particularly useful in mapping out the human genome, the creation of transgenic high yielding farm animals and crop plants, the development of insect-resistant crops and disease resistant farm animals. Recombinant DNA technology has also proven important to the production of vaccines and protein therapies such as human insulin, anti-viral interferons and human growth hormone. It has also contributed in the production and use of proteins, peptides and enzymes for various industrial manufacturing processes in biofuel, soap and detergent, brewing, food processing, dairy and paper industries.

This short course will provide information and practical experience of the techniques used to clone genes from genome-sequenced organisms, and express, in Escherichia coli, purify and characterise the products of these genes. This course emphasises on laboratory-based practical exercises to provide participants with relevant 'hands-on' experience of appropriate molecular biotechnology techniques.

COURSE DATE

January 2021
18 - 22 (Mon to Fri), 25 (Mon)

(6-day course)

DNA FINGERPRINTING

Trainer: Dr Rajarshi Sankar Ray

COURSE SYNOPSIS

DNA is the genetic material that we have in the chromosomes of our cells. The size of our genetic material is 3.4 billion base pairs. It contains all the information that keeps a cell alive and carries out its work.

Humans have very little genetic diversity. 99.9% our DNA sequences are the same in every person, yet enough of the DNA is different to distinguish one person from another. How different are you from your neighbour? Even the smallest difference in 3.4 billion base pairs is a lot. So you are unique.

DNA profiling also called DNA fingerprinting, DNA testing or DNA typing, is a forensic technique used to identify individuals by characteristics of their DNA. Flakes of skin, drops of blood, hair, and saliva all contain DNA that can be used to identify us.

In fact, the study of forensics, commonly used by police departments and prosecutors around the world, frequently relies on these small bits of shed DNA to link criminals to the crimes they commit. Thus DNA fingerprinting helps to solve criminal cases of murder and rape, clarify paternity and immigration disputes, identify a person who is absconding and so on.

In this workshop we will be carrying out a demonstration of how DNA fingerprinting is done in our life sciences lab. This workshop will be interesting for those who would like to gain knowledge to become legal investigators and for would-be officers of law enforcement and regulations.

COURSE DATE

December 2020
10-11 Dec (Thu to Fri)

(2-day course)

BASIC SEQUENCE ANALYSIS USING WEB-BASED TOOLS

Trainer: Maurice HT Ling

COURSE SYNOPSIS

Many bioinformatics tools have been developed over the years to help scientists plan their experiments.

This 2-day workshop is a tour de force of several major online bioinformatics tools. Day 1 will be an introduction of the tools, which will cover:
• Tools to predict peptide properties and enzymatic digestion
• Tools to predict Helical Domains and Functional Domains
• Codon Optimisation
• Simulation of restriction endonuclease digestion
• Analysis of sequence differences and building phylogeny

Day 2 will allow participants to work on a sequence of their interest, guided by the facilitator.

COURSE DATE

September 2020
14, 21 (Mon)

BEGINNER PYTHON PROGRAMMING FOR DATA ANALYSIS

Trainer: Maurice HT Ling

COURSE SYNOPSIS

Data analytics is instrumental in many areas of commerce, finance and health. This 3-day workshop aims to equip participants with basic skills to perform fundamental analytics using Python programming language and data analysis libraries.

Day 1 will cover basic constructs of the Python programming language with extensive hands-on practice to equip participants with the foundational skills to write Python statements.

Day 2 will go into Data Analytics using CRISP-DM as an analytical framework. This will include data understanding and preparation, before conducting analysis using artificial intelligence/machine learning approaches (such as supervised learning and clustering) and testing of the developed machine learning classifier.

Day 3 will be a capstone project where participants are encouraged to work on a set of data, with the guidance of the facilitator.

COURSE DATE

October 2020
1 (Thu), 2 (Fri), 5 (Mon)

(3-day course)

School of Life Sciences