



Maths and Computing training for Biology Researchers

Module 1: An Introduction in Quantitative Biology

SysMIC was developed by a consortium of leading UK universities with world-class expertise in bioscience research and distance learning.



Since 2012 we have welcomed over 2,000 UK researchers who collectively have completed more than 50,000 hours of training with us.

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Table of Contents

Introduction	4
Module Overview	6
Content	7
Sessions	8
Assessment	10
Certification	11
How to sign up	13

Introduction

Research work in the life sciences is increasingly interdisciplinary and quantitative in nature.

SysMIC provides training in these important areas; helping researchers to access new approaches and techniques, and to collaborate effectively across discipline boundaries.

The SysMIC training programme was developed with support from the BBSRC and is now run by the University College London. Our comprehensive online materials allow flexible study and are fully supported by expert tutors.

Our modules are a key component of several PhD training programmes across the UK, and a recognised means of CPD training for established and senior researchers.

This booklet provides some basic information about our SysMIC Module 1.

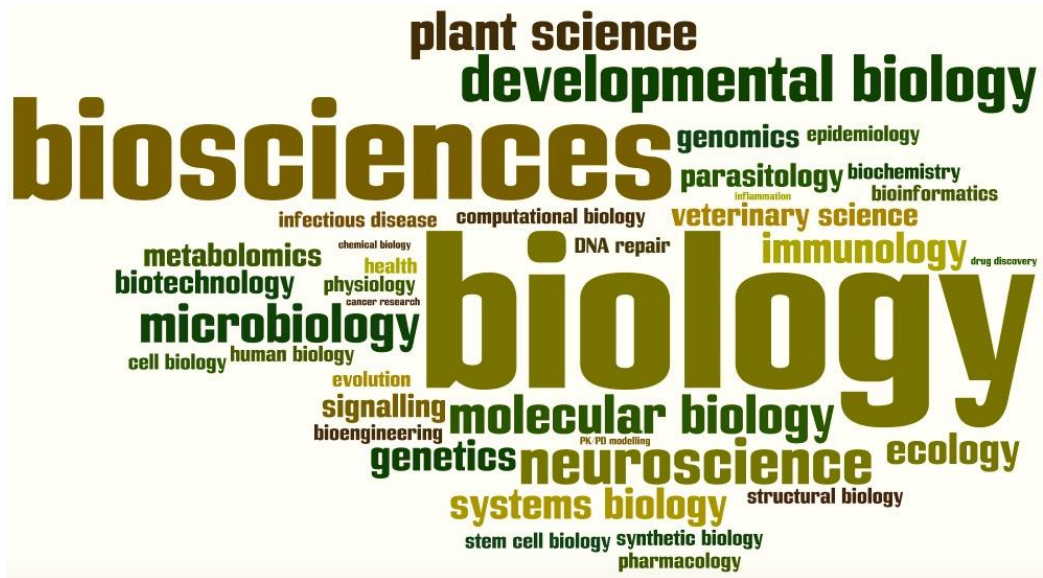


Illustration of reported interests of SysMIC participants.



Participants of a SysMIC intensive workshop

Module Overview

Module 1 covers the essential skills that are required to create and work with models of biological systems and analyse the related experimental data.

Sessions are delivered through a bespoke learning portal. This includes in-depth reading materials, video tutorials, quizzes, exercises, and access to help from SysMIC tutors. Typically the module takes 6 months to complete requiring around 5 hours study per week.

The module is designed to be accessible to those with little prior experience of programming. It includes background materials to aid those who have not studied advanced level mathematics.

It is recommended that participants who have prior experience in programming also start with this module, as it introduces examples and contexts that are the foundation for further development in Module 2.

Content

Computer Programming

- Programming using MATLAB
- Data analysis using R
- Bioinformatics programming using Python

Networks

- Network theory and visualisation
- Network Analysis
- Working with Petri nets

Modelling

- Mathematics for biological modelling
- Modelling reactions and gene regulation
- Simulation and analysis of ODE models

Statistics

- Sample distributions and the central limit theorem
- Hypothesis testing
- Analysis of gene expression data

Bioinformatics

- Dealing with sequences
- Functional programming
- Regular expressions

Miniproject

- Investigation of a simple biological model

Sessions

The sessions in Module 1 typically include:

i) Step-by-step tutorials

These explain new technique or concept using a worked example that uses a biological context. These provide the core activity of each session and includes code examples and practice exercises with answers.

ii) Assignment exercises

These are embedded within each tutorial and provided so you can practice your skills and consolidate your learning. Help completing the assignments can be obtained from our tutors, and model answers are made available after submission.

iii) Online-quizzes

Where new mathematical concepts are introduced we provide online quizzes. These are optional, but a good opportunity to practice and test understanding.

iv) Background reading

Alongside the tutorials we provide materials that have been adapted from the Open University mathematics courses. These are provided so that you have the option to study more deeply into the underlying mathematical concepts introduced in the course.

v) Help forums

For each session we have a dedicated forum where you can ask any question you have about the materials, exercises or quizzes. They also provide a bank of previous questions that have already been answered.

vi) A reflection activity

At the end of each session we ask you to complete a reflection activity. This forms a record of your learning in which you evaluate the skills you have developed and provides the opportunity to give feedback to the SysMIC team.

Assessment

To complete Module 1 you must complete 9 out of the 14 sessions, together with a mini project. The first part contains 8 Matlab sessions. Participants can then choose either statistics with R or bioinformatics programming in Python.

To complete you write a short report on the results of a miniproject investigation. Tutors will review and provide personal feedback on miniproject reports, if necessary you may be asked to act on their comments to correct your work.

We do not grade or provide feedback for the session quizzes and assignments, but may review them for additional evidence of your engagement with the course. The assignments we set allow you to test your understanding and practice your skills. Once you submit your work, you will be provided with model answers so you can review your work and have the opportunity to seek further help from tutors if necessary.

Certification

Upon completion of Module 1 you will receive a certificate with details of your training and achievements.

A digital copy of each certificate is stored and made accessible via the SysMIC site, enabling it to be digitally verified and added to online CVs.

Each module is worth 360 points on the Royal Society of Biology CPD scheme. These points can be used towards Chartered Biologist status.



For more information about SysMIC and examples of our training materials please visit our webpage at sysmic.ac.uk.

How to sign up

Module 1 has start dates in November and April each year.

The standard fee for Module 1 is £1,250. This covers full access to tutor support during your study, and continued access to the materials after you complete the course.

To register for Module 1 send your details and preferred start date to sysmic-team@sysmic.ac.uk

Notes:

- Doctoral students who wish to take the module should discuss it with their supervisor, as they may have access to training grants that can fund course fees.*
- Discounts are available for PhD students and group bookings*

Find out more about our modules at:

<https://sysmic.ac.uk>

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