MANCHESTER 1824
The University of Manchester

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TranslationManchester

Informatics Training Scheme 2023

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Introduction to Translation Manchester

Translation Manchester was established in May 2018 when the University was awarded a Wellcome Trust Translational Partnership Award (TPA) to help overcome the obstacles to conducting translational research in Greater Manchester. Translational research is the process by which basic scientific research is translated into patient-focused research that improves healthcare and wellbeing within society. Translation Manchester brings together a network of support, facilities and expertise to help researchers overcome the bottlenecks and hurdles that they encounter as they progress along the translational pathway. Our Translational Research Managers (TRMs) aid investigators by ensuring translatability of ongoing projects, forging new and productive connections between academic researchers and the clinical workforce, and manage four funding schemes - Access to Expertise (A2E), Confidence for Translation (C4T), Access to Tissue (A2T), and Translation for Early Career Researchers (T4E). Translation Manchester is here to help translational researchers who require support, advice or funding to progress their research towards implementation ultimately a health benefit for patients.

Introduction to the Informatics Training Scheme

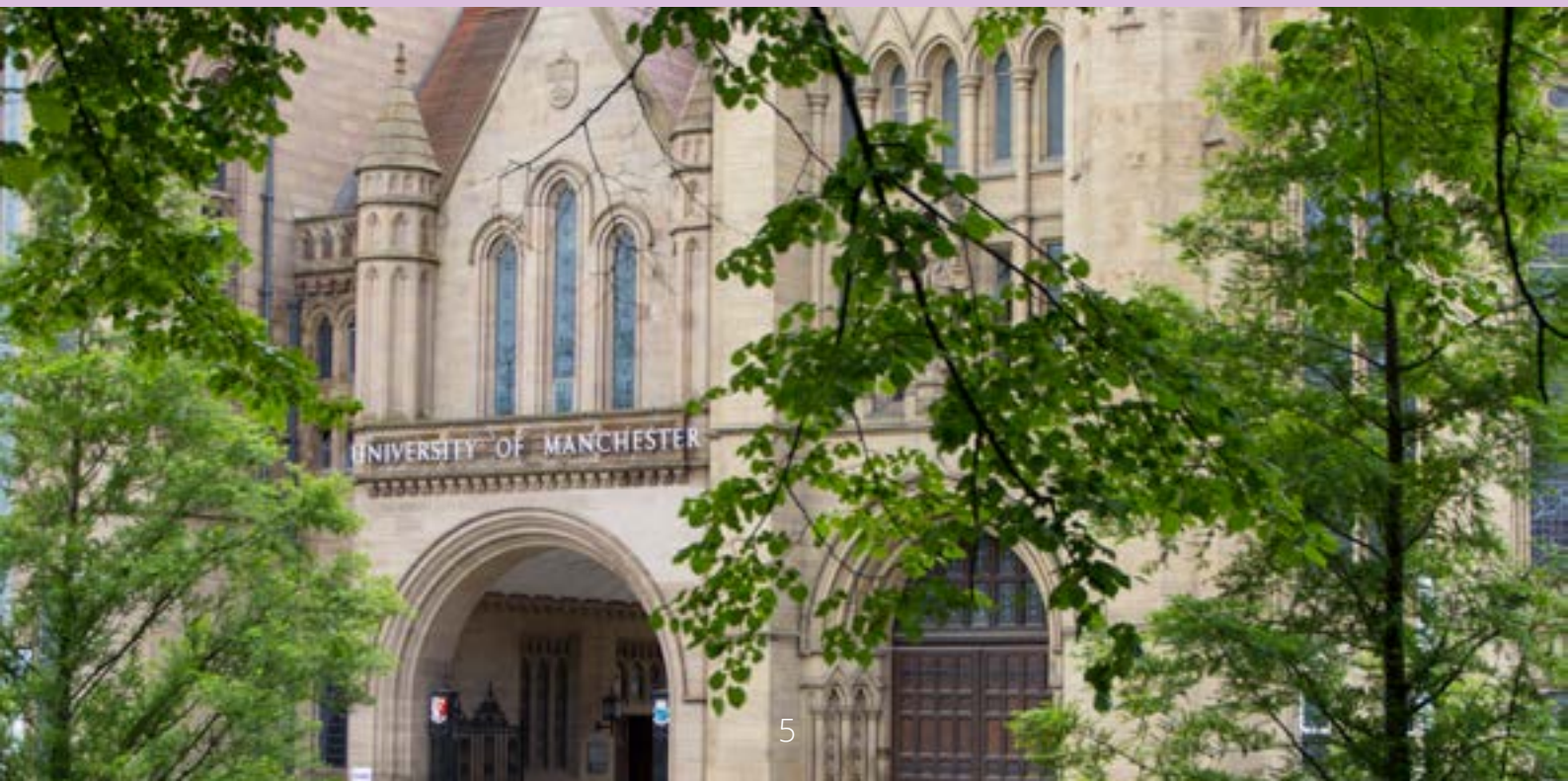
Access to informatics support and expertise has been identified as a bottleneck in translation research. To address this bottleneck, Translation Manchester has established the Informatics Training Scheme to enable researchers to develop or learn new skills that can be applied to their research. The Informatics Training Scheme offers researchers, at all career stages, an opportunity to upskill in informatics by taking selected units within the University of Manchester's postgraduate teaching portfolio within the School Biological Sciences (SBS) and School of Health Sciences (SHS). These course units have been selected for inclusion in the scheme because they provide participants with skills that are directly transferable to their research. This is a great opportunity for our researchers to access training from leading experts in the field that have been training clinical bioinformaticians for the NHS for several years.

The course units on offer through the Informatics Training Scheme are presented in this booklet. Before applying to the scheme, please consider which of these units would be most beneficial to your research and how you would implement the skills gained through the training. Participants must be able to dedicate the necessary

Foreword from Professor Nigel Hooper

Associate Vice-President for Research and Vice-Chair of Translation Manchester Strategic Oversight Group

This scheme is making a significant difference for translational researchers at all career stages. It provides a unique opportunity to build both capacity and capability in bioinformatics within research groups, in order to make the best use of the complex data generated. Our aim is to provide tailored learning opportunities to help accelerate the researcher's progression along the translational research pathway, leading to more impactful publications and translational funding.



Meet the Team

Dr Mudassar Iqbal
Lecturer in Health Data Sciences and Academic Lead of the Informatics Training Scheme

Building on the first two successful years, this expanded programme presents a great opportunity for training and upskilling for our researchers in wide ranging informatics areas. This training will positively impact individual researchers in their career progression and research groups in tackling existing research bottlenecks, thus making most of their in-house as well as relevant public data.

Dr Alessandro Faroni
Translational Research Manager at Translation Manchester

A survey conducted amongst our researchers has identified "access to bioinformatics expertise" as one of the greatest hurdles for translational research. In order to help researchers to overcome this bottleneck we launched the Informatics Training Scheme in 2019. Funded by Wellcome, this programme allows our researchers to access relevant units within several post-graduate taught (PGT) courses at our world-leading university which is ranked 7th in the UK for Biological Sciences and 8th for medicine (QS World University Rankings). Following the success from previous years, we are running the scheme again adding more units to the portfolio, including shorter 5 credit research methods units, and the successful Massive Open Online Courses (MOOC). We remain committed in providing our researcher with the tools they need to overcome the hurdles in their translational research, and the Informatics Training Scheme is a prime example of how we support researchers, enabling them to gain the skills that they need to analyse complex data leading on to high impact publications and successful grant applications.

Bioinformatics Support from Translation Manchester

From surveys of the research community here at Manchester access to bioinformatics support has been identified as one of the key bottlenecks to successful translational research. Aiming to help unblocking the bottlenecks and build the capacity in this area, Translation Manchester team is now pleased offer bioinformatics research support, through **Translational Research Bioinformatician Dr Lijing Lin**.

Request Bioinformatics Expertise

The Request Bioinformatics Expertise service is open to researchers across the University, NHS and their industrial partners, who have identified lack of bioinformatics expertise as a bottleneck to their research, and is provided through dedicated and personalised training. Examples of areas in which training and support can be provided include bioinformatics analysis for data generated from techniques such as RNA-seq, ChIP-seq, and ATAC-seq, proteomics data analysis, and flow cytometry analysis, as well as statistical analysis with cohort-based clinical data and electronic health records. Details on what we can help with and how to request support can be found on Translation Manchester website: **https://www.translation.manchester.ac.uk/training/request-bioinformatics-expertise/**

Bioinformatics Training Availability and a Collection of Learning Materials

We collate and update on a weekly basis a list of recently available bioinformatics related training availabilities. These include both internal and external training courses, covering programming, data analysis, as well as more domain-specific bioinformatics skills. We also collate a list of online bioinformatics training/learning materials that are free to use and appropriate for self-learning. Follow the links below for more details

https://www.translation.manchester.ac.uk/2022/03/15/bioinformatics-training-availability-overview-2022/

https://www.translation.manchester.ac.uk/2022/05/31/bioinformatics-training-collection/

Testimonials

The course taught me much of the mathematical and statistical principles that underlie the bioinformatics tools that I readily use day-to-day...my main take-home from the course is the breadth of online tools available to researchers like me... my work moving forward will certainly be harnessing the power of these resources in order to independently analyse publicly-available and in-house sequencing data

- Bioinformatics

This programme has improved the robustness of my research...correctly designing the study, analysing and interpreting my data is crucial in order to translate the findings to the clinical area, hopefully, leading to the development of effective preventive, screening and treatment strategies

- Fundamentals of Epidemiology

The course provided an excellent insight into how to handle, analyse, and present sequencing data, including how secondary databases are used to generate metadata on gene function... as an early career researcher, I was keen to gain experience in a bioinformatic approach which is more clinically relevant

- Bioinformatics, Interpretation, Statistics and Data Quality Assurance

This training has helped provide a groundwork to develop my informatics skills... starting from an absolute beginner, I feel that the information provided has helped me grasp the fundamentals, which can be very difficult without guidance... it has taught me the fundamentals of coding project structure, data sharing using Git, and helped me along the path to be able to build useful programmes from scratch using python, which will be invaluable...(these skills) will be important for transitioning from basic research to larger scale translational projects

- Introduction to Programming

Course Title and Units

Difficulty level:
- beginner
- intermediate
- advanced

MSc Bioinformatics and Systems Biology (SBS)

Programme director: **Dr David Talavera & Dr Jean-Marc Schwartz**

MORE DETAILS

Units on Offer	Unit Code	Start Date	End Date	Difficulty level
Programming Skills	BIOL60201	25/9/23	15/12/23	🟡
Bioinformatics	BIOL60791	25/9/23	15/12/23	🟡
Statistics & Experimental Design	BIOL65161	25/9/23	08/12/23	🟡🔴
Computational Approaches to Biology	BIOL66021	25/9/23	15/12/23	🟡🔴

PG Cert Clinical Bioinformatics (SHS)

Programme director: **Dr Michael Cornell**

MORE DETAILS

Units on Offer	Unit Code	Start Date	End Date	Difficulty level
Introduction to Clinical Bioinformatics	IIDS60100	May 24	August 24	🟢🟡
Introduction to Health Informatics	IIDS60110	04/09/23	12/11/23	🟢🟡
Introduction to Programming	IIDS60120	20/11/23	16/02/24	🟢🟡
Introduction to Next-Generation Sequencing	IIDS60130	26/02/24	17/05/24	🟡

Difficulty level:
- beginner
- intermediate
- advanced

MSc Genomic Medicine (SBS)

Programme director: **Dr David Gerrard**

Units on Offer	Unit Code	Start Date	End Date	Difficulty level
Health Informatics	BIOL 67361	30/10/23	03/11/23	●●
Economics of Genomic and Precision Medicine	BIOL 67372	26/02/24	01/03/24	●●

Master of Public Health (SHS)

Programme director: **Professor Arpana Verma**

Units on Offer	Unit Code	Start Date	End Date	Difficulty level
Fundamentals of Epidemiology	POPH60991	02/10/23	20/05/24	●●
Digital Public Health	POPH65022	05/02/24	20/05/24	●●
Implementation Science	POPH64551	02/10/23	15/01/24	●
Practical Statistics for Population Health	POPH60982	07/02/23	24/04/23	●
Applied Epidemiology	POPH60112	05/02/24	20/05/24	●●
Qualitative Research Methods	POPH63121	02/10/23	-15/01/24	●

Difficulty level:
- beginner
- intermediate
- advanced

Unfacilitated Self-paced Courses

Research Methods

Programme director: **Frances Hooley**

Units on Offer	Unit Code	Start Date	Difficulty level
Introduction to Statistics	RM1-STAT		●
Introduction to Python Programming	RM2-PHYT		●
Introduction to Machine Learning	RM3-MLEA		●

Other Learning Opportunities

Massive Open Online Courses (MOOCs)

Programme director: **Professor Andy Brass**

Units on Offer	Unit Code
Clinical Bioinformatics: Unlocking Genomics in Healthcare	MOOC1
AI for Healthcare: Equipping the Workforce for Digital Transformation	MOOC2

Course title: **MSc Bioinformatics and Systems Biology**

Programming Skills

Unit code: **BIOL60201**

Unit co-ordinator: **Prof Simon Hubbard**

Overview and Aims

This unit aims to introduce basic programming skills to the non-expert, including the unix environment, command line driven computing, and the Python programming language. Practical sessions are coupled to the lectures, proving an opportunity to test out new skills, tackle exercises, and work on your project code.

- Develop relevant IT skills for bioinformatics, including the unix environment.
- Introduce Python programming language.
- Develop skills in writing programs to solve biological data handling problems.

Teaching method

Lectures: 12 hours

Practical sessions: 22 hours

Project work: Two programming projects will be completed in a period of approximately 8 weeks during Semester 1, in the practical classes and in the students' own time.

Assessments

Two project reports, software and demonstration of software resulting from the second project.

Which researchers would benefit?

- Researchers working on projects that involve programming with Python for which they do not have the required expertise.
- Researchers considering the addition of, or have a need for, programming expertise to further their future research.
- Researchers who need a better understanding of programming to understand it utility in handling biological data sets.
- Researchers who want to communicate their research need more effectively with experienced programmers.

Terms and Conditions

Participants will be expected to participate fully in the group work assessment, which is part of project 1. Participants are encouraged to take part in unit assessments as they are integral to the leaning process, however you must not submit assessments and these will not be marked. The teaching commitments for this unit involves attending lectures, practicals, and undertaking group work to which participants must be able to dedicate the necessary time.

Course title: **MSc Bioinformatics and Systems Biology**

Bioinformatics

Unit code: **BIOL60791**

Unit co-ordinator: **Dr David Talavera**

Overview and Aims

This unit introduces sequence and structure analysis techniques, tools and resources (including molecular evolution and phylogeny), and provides an overview of transcriptomics and comparative genomics.

- Understand a range of bioinformatics and 'omics analysis tools, resources and databases.
- Understand genomic and transcriptomic data types including methods for genome sequencing and analysis.
- Understand pattern-recognition concepts underpinning commonly used analysis tools and the importance of synthetic analysis and interpretation of resource outputs.

Teaching method

Teaching delivered face-to-face.

Practical sessions on sequence analysis; genomics and transcriptomics; protein structure and phylogenetics.

Assessments

Written reports on practical assignments are optional, they should not be submitted as these will not be marked. At the end of of each session, there are a series of built-in multiple choice questions that cover all aspects of the lecture.

Which researchers would benefit?

- Researchers handling proteomic, genomic and transcriptomic data sets.
- Researchers seeking an understanding of the bioinformatics and 'omics tools, resources and databases.
- Researchers who want to develop a better understanding of the concepts underpinning commonly used bioinformatic analysis tools.

Terms and Conditions

Participants are encouraged to take part in unit assessments as they are integral to the learning process, however you must not submit assessments and these will not be marked.

Course title: **MSc Bioinformatics and Systems Biology**

Statistics and Experimental Design

Unit code: **BIOL65161**

Unit co-ordinator: **Dr Christopher Knight**

MORE DETAILS

Overview and Aims

This unit provides and introduction to data handling, presentation and statistical data analysis and aims to introduce the methods and tools used in statistical data analysis, as wells as the procedures and tools used in the design of experiments.

- Overview of statistics and hypothesis testing, types of data and graphs, descriptive statistics, basics of R statistical programming language.
- Probability distributions, confidence intervals, bootstraps, hypothesis testing using a one-sample distribution.
- Parametric and non-parametric tests to compare variances, means, proportions and counts in contingency tables. Covariance, parametric and non-parametric correlation.
- Estimating slope and intercept, statistical significance of regression, regression in R, model assumptions, model checking, and transformation.
- One-way, two-way and factorial ANOVA, model simplification, model assumptions and pseudoreplication.
- Foundation in experimental design including; standardization, sample size, hypothesis testing, experimental units, controls, replication, randomization, independence, pseudoreplication, covariates and power analysis as applied to basic statistical tests.

Teaching method

Delivery and assessment will be through lectures, workshops, group discussions, e-learning and computer practical sessions.

Assessments

Online multiple choice exam and statistics assessment. Critical assessment of literature, statistics practical exercises (5 x 3 hours in length) and project review assignment (1 week in length).

Which researchers would benefit?

- Researchers wanting to use R for basic statistics.
- Researcher who feel they need a better understanding of statistics and how to select the appropriate tests and analysis for their datasets.
- Researchers looking to apply statistics to their experimental designs.

Terms and Conditions

Participants are encouraged to take part in unit assessments as they are integral to the learning process, however you must not submit assessments and these will not be marked.

Course title: **MSc Bioinformatics and Systems Biology**

Computational Approaches to Biology

Unit code: **BIOL66021**

Unit co-ordinator: **Dr Jean Marc Schwartz**

Overview and Aims

This unit introduces a range of computational techniques, including differential equations, machine-learning, network and constraint-based analysis, which are used for a wide range of biomedical and biotechnological applications, from understanding how intracellular signalling pathways are disrupted in diseases to redesigning organisms by metabolic engineering.

- Dimensionality reduction and clustering: Principal Component Analysis (PCA) and interactive plotting with applications to visualising single-cell expression data; Clustering; Non-linear dimensionality reduction methods: GPLVM and t-SNE for non-linear dimensionality reduction and visualisation of single-cell data;
- Models of large cellular systems: Network reconstruction and analysis; Logical modelling;
- Dynamic model: Introduction to differential equations-based modelling; Modelling gene regulatory pathways
- Next-generation sequencing: from laboratory experiments to computational analysis; RNA-seq workflow; Viruses

Teaching method

The unit will be delivered as a succession of lectures (1 hour) and practical sessions (2 hours), where each lecture will introduce the theory behind a method/tool, and students will apply the method/tool to solve a particular biological problem in the practical.

Students will be assessed by completing four in-sessional online modules, one for each of the main sections of the unit, taking place during the last practical of the respective section. These modules will consist of a series of multiple choice questions and short questions, some of which will require a short piece of code to be written.

Assessments

Participants will be assessed by completing three in-sessional online modules, one for each of the main sections of the unit, taking place during the last practical of the respective section. These modules will consist of a series of multiple choice questions and short questions, some of which will require a short piece of code to be written.

Which researchers would benefit?

- Researchers wanting to apply computational modelling to their datasets.
- Researchers analysing data sets from high throughput technologies.

Terms and Conditions

Participants should have a basic understanding of Python and programming (which are covered in other units in this course). Participants are encouraged to take part in unit assessments as they are integral to the learning process, however the assessments must not be submitted and won't be marked.

Course title: **PGCert Clinical Bioinformatics**

Introduction to Clinical Bioinformatics

Unit code: **IIDS60100**

Unit co-ordinator: **Dr Ang Davies**

MORE DETAILS

Overview and Aims

This unit will provide students with a background knowledge of human genomics, with a particular emphasis on the application to the clinical setting.

- Application of next generation sequencing technologies in the clinic and how they are transforming patient care.
- Introduction to the basic concepts of next generation sequencing and how the resulting genomic data is analysed.
- Introduction to bioinformatics tools, databases and the methodology that will help to make sense of all of this clinical genomic data.
- The governance and ethical frameworks in place within the NHS and how they apply to bioinformatics.

Teaching method

Online distance learning, 15 hours average weekly study, total of 150 hours independent study.

Assessments

Written assignment and oral presentation are optional, if submitted they will be marked at the discretion of the unit co-ordinator.

Which researchers would benefit?

- Researchers wanting to apply computational modelling to their datasets.
- Researchers analysing data sets from high throughput technologies.

Terms and Conditions

Participants should have a basic understanding of R and programming (which are covered in other units in this course). Participants are encouraged to take part in unit assessments as they are integral to the learning process, These assessments, if submitted, will be marked at the discretion of the unit co- ordinator.

Course title: **PGCert Clinical Bioinformatics**

Introduction to Health Informatics

Unit code: **IIDS60110**

Unit co-ordinator: **Helen Hulme**

Overview and Aims

This unit introduces the main areas in health informatics that ultimately influence the delivery of healthcare. With a focus on the electronic patient record and the different informatics areas and concepts including the importance of coding healthcare delivery consultations; challenges and benefits of sharing data across the health system; and the human an organisational factors that are considered when introducing informatics solutions into the healthcare system.

Teaching method

Online distance learning, 15 hours average weekly study, total of 150 hours independent study.

Assessments

Written assignment and oral presentation are optional, if submitted they will be marked at the discretion of the unit co-ordinator.

Which researchers would benefit?

- Researchers seeking an understanding of the challenges associated with implementing informatics solutions in the NHS.
- Researchers seeking information on the use of patient records in health informatics and the challenges in capturing clinical data
- Researchers seeking of understanding of medical coding

Terms and Conditions

Participants should have a basic understanding of R and programming (which are covered in other units in this course). Participants are encouraged to take part in unit assessments as they are integral to tThese assessments, if submitted, will be marked at the discretion of the unit co- ordinator.

Course title: **PGCert Clinical Bioinformatics**

Introduction to Programming

Unit code: **IIDS60120**

Unit co-ordinators: **Frances Hooley and Peter Causey-Freeman**

Overview and Aims

This unit will provide trainees with a sound introduction to programming and safe and effective software development practice. It is often the case that specific tools and resources that would be useful in a clinical setting are not available commercially. Therefore the ability to be able to develop safe and effective code for use within the trainee's organisation is an important part of the skill set of an effective information scientist.

- Understand the relationship between UNIX and Linux operating systems.
- Connect commands together using pipes and filters and develop shell scripts to analyse biological data.
- Express a clear understanding of the basic principles of the Python programming language and explain the features of Python that support object-oriented programming.
- Understand the need for repositories to manage code and construct a Git repository to manage Python code.
- Critically evaluate the Agile and Waterfall software development models.

Teaching method

Online distance learning, 15 hours average weekly study, total of 150 hours independent study.

Assessments

Written assignment and oral presentation are optional, if submitted they will be marked at the discretion of the unit co-ordinator.

Which researchers would benefit?

- Researchers working on projects that involve programming with Python for which they do not have the required expertise.
- Researchers who need a better understanding of how programming is useful in the clinical setting.

Terms and Conditions

Participants are encouraged to take part in unit assessments as they are integral to the learning process. These assessments, if submitted, will be marked at the discretion of the unit co- ordinator.

Course title: **PGCert Clinical Bioinformatics**

Introduction to Next Generation Sequencing

Unit code: **IIDS60130**

Unit co-ordinator: **Andrew Devereau**

Overview and Aims

This unit will extend the knowledge of the wide range of bioinformatics pipelines, tools and resources that are used in bioinformatics to process genomic data, and how such tools are used by clinical bioinformaticians to support patient centred care, diagnosis and treatment. A strong emphasis will be placed on ethical and confidentiality issues that arise with such sensitive data.

- Explain the scope and application of genetic testing and sequencing technologies.
- Critically appraise sequencing platforms and approaches and their uses in clinical diagnostics.
- Evaluate gene and disease information in the design of a gene panel.
- Evaluate different NGS bioinformatics software used in the analysis of variant data.
- Describe the development, implementation strategies and operation of bioinformatic analysis pipelines.

Teaching method

Online distance learning, 15 hours average weekly study, total of 150 hours independent study.

Assessments

Written assignment and oral presentation are optional, if submitted they will be marked at the discretion of the unit co-ordinator.

Which researchers would benefit?

- Researchers involved in next generation sequencing related projects that seek to implement a genetic test in the clinic.
- Researchers planning a next generation sequencing project, who want to understand the platforms available, gene panel designs and the bioinformatics analysis pipeline.

Terms and Conditions

This unit follows on from *Introduction to Clinical Bioinformatics*, applicants that haven't taken this unit should have a basic understanding of the principles covered in that unit. Participants are encouraged to take part in unit assessments as they are integral to the learning process. These assessments, if submitted, will be marked at the discretion of the unit co- ordinator.

Course title: **MSc Genomic Medicine**

Health Informatics

Unit code: **BIOL67361**

Unit co-ordinator: **Prof Evangelos Kontopantelis**

Overview and Aims

This unit will introduce health informatics knowledge and an understanding of the skills and tools needed by all professionals in modern healthcare systems to provide safe, secure high quality, effective patient centred services. Participants will gain an understanding of electronic patient records, why they are so important, and why it is so difficult to do well. Governance and data security problems surrounding the capture, use and sharing of such data will also be covered

Teaching method

Blended learning with e-learning preparation materials, group problem based learning and face-to-face lectures and open discussions.

Assessments

Written assignment is optionaland must not be submitted. If submitted, they won't be marked. Group work participation is compulsory.

Which researchers would benefit?

- Researchers who require access to patient records for research purposes and are seeking an understanding of the how these records are kept.
- Researchers who are seeking a better understanding of the governance, data security and data sharing issues associated with electronic patient records.

Terms and Conditions

Participants are encouraged to take part in unit assessments as they are integral to the learning process, group work participation is compulsory but the written assessment must not be submitted and won't be marked.

Course title: **MSc Genomic Medicine**

Economics of Genomics and Precision Medicine

Unit code: **BIOL67372**

Unit co-ordinators: **Dr Alexander Thompson and Dr Sean Gavan**

Overview and Aims

This unit will provide the student with the skills to understand economic evidence generated from model-based economic evaluations of interventions relevant to human genomics. The aim is for students to be able to critically appraise model-based economic evaluations to assess whether the evidence is relevant to their jurisdiction and particular resource allocation decision problem. The course materials will provide an introduction to the key economic principles and theories that underpin the use of methods of economic evaluation, describe the different methods of economic evaluation, the role of model based economic evaluations and provide applied examples of how to structure and critique model-based economic analyses.

Teaching method

Blended learning with face to face lectures, interactive workshops, e-learning materials, individual structured tasks and online group forum for discussion and feedback.

Assessments

Written exam and assignment are optional.

Which researchers would benefit?

- Researchers seeking an understanding of the model based economic evaluation of genomics and personalised medicine which are on the path to implementation.
- Researchers considering a health economics study on the clinical value of their translational research such as delivery of biomarkers in routine clinical practise.

Terms and Conditions

Participants are encouraged to take part in unit assessments as they are integral to the learning process, however assessments must not be submitted and won't be marked. Participation in the group forum is strongly encouraged.

Course title: **Masters in Public Health**

Fundamentals of Epidemiology

Unit code: **POPH60991**

Unit co-ordinator: **Dr Tracey Farragher**

Overview and Aims

In this unit participants will learn about the history of the discipline of epidemiology and its applications to public health. Common types of observational study designs will be introduced including; ecological studies, cross-sectional surveys, case-control studies, cohort studies and intervention studies.

- Understanding of key epidemiological studies, different measures of risk, how to calculate them and how this relates to understanding disease causation.
- Calculate incidence and prevalence rates of diseases within a population and understand the methods used in ecological studies, cross-sectional surveys, case-control studies, cohort studies and intervention studies.
- Understand bias, confounding and effect modification.

Teaching method

Online distance learning with 10 weekly topics and links to external web materials/ reading materials. Group discussions tasks will be conducted on online and moderated by the course unit leader and teaching assistants.

Assessments

At the end of most topics there is a self-test with automated feedback. There are also two optional written assessments.

Which researchers would benefit?

- Researchers and public health professionals involved with either conducting health-related research or interpreting the findings of research studies. understating of the techniques but require a more in depth understanding to apply them to their specific research projects.

Terms and Conditions

A group work discussion task is compulsory and participants are encouraged to take part in other assessments and discussions as they are integral to the learning process, however the assessments (apart from group work) must not be submitted and won't be marked.

Course title: **Masters in Public Health**

Practical Statistics for Population Health

Unit code: **POPH60982**

Unit co-ordinator: **Dr Isla Gemmell**

Overview and Aims

This unit will provide participants with an understanding of statistics that they can apply within their own professional practice. This could include conducting quantitative research, interpreting the findings of quantitative research studies or applying statistical thinking to public health practice. The course will teach you how to conduct statistical analyses using a statistical package (SPSS or R).

- Define different types of data and demonstrate an understanding of confidence intervals and the normal distribution.
- Perform correlation and simple linear regression and interpret the results.
- Construct and interpret multiple regression models and logistic regression models demonstrating an understanding of confounding.
- Perform and interpret survival analyses.

Teaching method

Online distance learning with 10 weekly topics and links to external web materials/ reading materials. Weekly group discussions will be conducted on online and moderated by the course unit leader and teaching assistants.

Assessments

The course consists of 10 topics and within each topic there is a self-test to complete. There are also two optional written assessment.

Which researchers would benefit?

- Researchers whose careers will involve either conducting quantitative research or interpreting the findings of quantitative research studies.
- Researchers wanting to learn how to use statistical analysis package in SPSS or R.

Terms and Conditions

Group discussions are compulsory and participants are encouraged to take part in other assessments as they are integral to the learning process, however assessments must not be submitted and won't be marked.

Course title: **Masters in Public Health**

Implementation Sciences

Unit code: **POPH64551**

Unit co-ordinator: **Ms Clare Huish**

Overview and Aims

This unit is an introduction to the approaches needed to implement policy and research findings in real-world health and social care settings, from a local to a global context. The aim of the unit is to provide an introduction to implementation and improvement sciences for health and social care for the improvement of health and wellbeing.

- The processes of clinical governance and the audit cycle
- Policy analysis and impact
- Interpreting research findings to your setting
- Implementing new innovations
- Making informed decisions for transformational change in health and social care settings
- Global implementation sciences

Teaching method

Online delivery, participants can work through course content at their own pace. Participants will be asked to bring a professional or relevant personal development `problem' to the course.

Assessments

Two optional written assignments..

Which researchers would benefit?

- Researchers and public health professionals wanting to understand and apply implementation science to health and social care.

Terms and Conditions

Participation in the group discussion forum is strongly encouraged. The written assessments must not be submitted and won't be marked.

Course title: **Masters in Public Health**

Digital Public Health

Unit code: **POPH65022**

Unit co-ordinator: **Dr Omer Ali**

MORE DETAILS

Overview and Aims

This unit covers the implications of digital innovation for public health and people's everyday lives, including health and wellbeing. Digital technology is rapidly changing the way people live, interact, learn, and work. This offers new opportunities for health professionals to interact with and engage people, and digital tools offer new ways to gather and analyse data and subsequently improve public health.

- To synthesise the impacts of digital technologies and tools on, and implications for health.
- To provide an introduction to digital public health and the policies and actions taken around the world to integrate technology into public health efforts.
- To develop an understanding of digital health interventions and digital data collection and analysis tools.

Teaching method

Online delivery, participants can work through course content at their own pace.

Assessments

Two optional written assignments.

Which researchers would benefit?

- Researchers and public health professionals wanting to understand the implications of digital innovations for public health.

Terms and Conditions

Participation in the group discussion forum is strongly encouraged. The written assessments must not be submitted and won't be marked.

Course title: **Masters in Public Health**

Applied Epidemiology

Unit code: **POPH60112**

Unit co-ordinator: **Arpana Verma**

Overview and Aims

Knowledge of epidemiology to this level is essential for those embarking on a career in public health and for those intending to pursue research. Clinicians and managers of clinical services should find a deeper appreciation of epidemiology, particularly as it relates to health services evaluation, useful.

This is an interactive online course. Students must work through the online course material. Students are encouraged to use the Blackboard discussion boards to ask questions and check their understanding of the course material. This unit is intended to equip students with the knowledge and skills required to enable them to undertake epidemiological research, albeit under supervision. On completion of this unit, successful students will be able to:

- Design and interpret epidemiological studies.
- Comment on the advantages and disadvantages of the commonly used epidemiological approaches; the selection of a study design suitable for an issue at hand; the handling of error, bias and confounding; the imputation of causality; and appropriate approaches to data handling.

Teaching method

This course involves working through the course notes provided online, reading all references marked "required", looking at additional readings suggested where appropriate, using self-reflection to help you think about the ideas discussed, and participating in weekly discussion boards with fellow students and tutors. Participation in the discussion boards is not formally assessed; however, it is greatly encouraged.

Which researchers would benefit?

- Researchers looking to gain the knowledge and skills and enable to undertake epidemiological research including study design and populations, data collection and analysis and causal inference.

Assessments and Terms & Conditions

Participation in the group discussion forum is strongly encouraged. The written assessments must not be submitted and won't be marked.

Course title: **Masters in Public Health**

Qualitative Research Methods

Unit code: **POPH63121**

Unit co-ordinator: **Annie Harrison and Christine Greenhalgh**

Overview and Aims

This unit is suited to anyone working as a health worker or researcher who is interested in learning about qualitative research methods. Some students take this unit to better understand published research. Others who have previously only studied quantitative research methods take this unit to gain an insight into different ways of thinking about research. For students who are planning a career or research using these methods, this unit is an excellent introduction.
This unit is designed to introduce students to the theory behind qualitative research and a number of qualitative research methods. This unit aim to enable students to develop the skills to use qualitative methodology in public health and primary care research. On completion, students should be able to understand and appreciate qualitative research and undertake basic research.

Teaching method

This unit introduces students to the theoretical knowledge that underpins qualitative research and also introduces students to a number of well used qualitative methodologies. As well as online and web-based readings, students will also have the opportunity to undertake a number of practical exercises, which will contribute towards the assessment of this unit. This enables students to practically apply what they have learnt to real-life practice.

Assessments and Terms & Conditions

Participation in the group discussion forum is strongly encouraged. The written assessments must not be submitted and won't be marked.

Which researchers would benefit?

- Researchers or health workers who are interested in learning about qualitative research methods and developing the skills to use qualitative methodology in public health and primary care research.

- Researchers looking to develop their skills in qualitative data collection (e.g. interviews) and data analysis (e.g. thematic analysis).

Unfacilitated Self-paced Courses

These research methods courses consist in shorter self-led five credit units

Course title: **Research Methods**

Introduction to Statistics

Unit co-ordinator: **Frances Hooley**

Unit code: **RM1-STAT**

Overview and Aims

This practical course will help you develop your statistical thinking so you become critical consumers of statistically-based results in biomedical and health research. You will learn how to solve basic statistical problems and be able to critically appraise statistics-based issues and explain the need and importance of data in statistics. In order to apply the learning after the course the materials will source current problems, use commonly-used tools and be geared towards real-world problems and contexts where possible.

Teaching Method

Self-led asynchronous activities that can be undertaken individually at your own pace. Pedagogically, the type and mix of activities will follow an active learning approach and will encourage you to explore topics further for yourself. Total of 40 hours self-led learning. Formative assessment only.

Learning Objectives

Learning Type	At the end of this course you will be able to:
Knowledge and understanding	Identify questions for which the investigative process in statistics would be useful
	Explain the central role of variability and sampling in the field of statistics
	Demonstrate an awareness of ethical issues associated with sound statistical practice.
	Explain how statistical models, including multivariable models, are used.
	Describe Problem, Plan, Data, Analysis, Conclusion (PPDAC) problem-solving cycle
	Identify questions for which the investigative process in statistics would be useful
Intellectual skills	Demonstrate an understanding of, and ability to use, basic ideas of statistical inference, both hypothesis tests and interval estimation, in a variety of settings.
	Appraise statistically-based results reported in popular media, recognizing whether reported results reasonably follow from the study and analysis conducted.
	Evaluate questions using the investigative process
Practical skills	Produce graphical displays and numerical summaries and interpret what these do and do not reveal.
	Interpret and draw conclusions from standard output from statistical software.
Transferable skills and personal qualities	Manage data collection and analysis
	Demonstrate project planning skills
	Apply problem solving

Course title: **Research Methods**

Introduction to Programming (with Python)

Unit co-ordinator: **Frances Hooley**

Unit code: **RM2-PYTH**

Overview and Aims

This practical course will help you develop your Python programming skills and be able to use the tools, problem solving methods and use basic principles of Python to answer programming problems. You will be able to apply the learning after the course to current problems, use commonly-used tools and simulate professional practice where possible.

Teaching Method

Self-led asynchronous activities that can be undertaken individually at your own pace. Pedagogically, the type and mix of activities will follow an active learning approach and will encourage you to explore topics further for yourself. The coding materials will be delivered through GitHub using Jupyter Notebooks which are web based notebooks that have executable code examples in short snippets alongside practice-based tasks. The notebooks help you to practice coding in a safe, self-contained interactive environment which you can take away after the course has run. Total of 40 hours self-led learning. Formative assessment only.

Learning Objectives

Learning Type	At the end of this course you will be able to:
Knowledge and understanding	Be able to express a clear understanding of the basic principles of the Python programming language.
	Explain the features of Python that support object-oriented programming
	Create functioning and well documented Python code
	Explain the need for repositories to manage code.
	Critically evaluate the Agile and Waterfall software development models.
Intellectual skills	Think about programming problems in an abstract way and make critical judgement regarding programming decisions.
	Solve programming problems in an efficient and effective manner.
	Plan, conduct and report on a programming problem
Practical skills	Developing programming skills
	Planning and executing the development of a programming project
	Using electronic and online resources
	Using reporting skills
Transferable skills and personal qualities	Computer literacy – ability to use computing skills in the development of a programming assignment
	Presentation skills – capacity to make presentations, using appropriate media for a target audience
	Time Management – ability to schedule tasks in order of importance

Course title: **Research Methods**

Introduction to Machine Learning

Unit co-ordinator: **Frances Hooley**

Unit code: **RM3-MLEA**

Overview and Aims

This course will introduce Machine Learning in health data science. You will develop your knowledge and understanding of the importance of data management and quality. You will critically appraise the use of machine learning methods within studies on health datasets and be able to begin planning strategies involving machine learning methods for data in your own context.

Teaching Method

Self-led asynchronous activities that can be undertaken individually at your own pace. Pedagogically, the type and mix of activities will follow an active learning approach and will encourage you to explore topics further for yourself. Total of 40 hours self-led learning. Formative assessment only.

Learning Objectives

Learning Type	At the end of this course you will be able to:
Knowledge and understanding	Explain basic machine learning concepts and terminology
	Describe the features of effective machine learning in health data science.
Intellectual skills	Critically appraise the use of machine learning on existing health data research studies
	Investigate how the application of machine learning could benefit studies professionally
	Describe strategies to apply appropriate machine learning methods to help answer current health data challenges in your own practice
Practical skills	Investigate key features of three machine learning methods (Random Forest, Regression and Principle Components Analysis)
	Examine different rich health datasets
Transferable skills and personal qualities	Demonstrate project planning skills
	Apply problem solving tools and techniques

Other learning opportunities:

Course title: **Massive Open Online Course (MOOC)**

Clinical Bioinformatics: Unlocking Genomics in Healthcare

Unit co-ordinators: **Ang Davies, Andy Brass, Becki Bennet**

Teaching method: **Online delivery, 5 weeks, 2 hours per week**

Overview and Aims

This free online course aims to raise awareness amongst healthcare professionals of the role of Clinical Bioinformatics and Genomics in healthcare today. The course illustrates how the discipline of Clinical Bioinformatics provides an important bridge between the cutting-edge science and the delivery of genomic medicine in clinical practice.

By the end of the course, you'll be able to:

- Describe the role of a Clinical Bioinformatician in making a difference in the patient's journey
- Identify the types of tools and technologies a clinical bioinformatician uses to filter and classify the information from the human genome
- Apply knowledge of clinical bioinformatics to clinical case studies
- Investigate the typical daily challenges of developing bioinformatics to support the genomic revolution in healthcare
- Explain how Clinical Bioinformatics provides an important bridge between the cutting edge research of Genomic Medicine with the practicalities and sensitivities of a clinical setting
- Explore the stages of the clinical bioinformatics workflow
- Explain the ethical and legal considerations that need to be made when working with genomic data

Which researchers would benefit?

This course is aimed at current healthcare professionals, who are interested in learning more about the role of clinical bioinformatics and will also be applicable to people with an interest in the application of genomics in healthcare. It is not essential to have previous experience or knowledge of bioinformatics or genomics although medical terminology is used and the course is designed to be applicable to practising healthcare professionals.

Course title: **Massive Open Online Course (MOOC)**

AI for Healthcare: Equipping the Workforce for Digital Transformation

Unit co-ordinators: **Dr Angela Davies, Prof Andy Brass, Dr Alan Davies, Dr Iliada Eleftheriou**

Teaching method: **Online delivery, 5 weeks, 2 hours per week**

Overview and Aims

Build your digital understanding and become a champion for AI in healthcare. AI is transforming healthcare in a variety of beneficial ways, from streamlining workflow processes to making more precise patient diagnoses. However, this is not without its challenges. The University of Manchester has partnered with Health Education England to create a course for you to see real-world examples of how AI is transforming areas such as radiology, pathology, and nursing. On this course, you will develop your own digital skills and increase your understanding of technology for healthcare, so that you can join the conversation on embedding AI in healthcare practice.

By the end of the course, you'll be able to:

- Describe the benefits and challenges of Artificial Intelligence (AI) in healthcare across the broader spectrum of the health sector
- Investigate the challenges and opportunities of data in healthcare to transform patient care
- Apply learning to authentic and practice-based case studies which look at a range of applications of AI
- Explore the concepts, ethical principles and approaches of AI within healthcare
- Explore the roles, teams and skills required to enable AI in healthcare
- Develop current practice, skills and knowledge to support recommendations from the Topol Review

Which researchers would benefit?

This course is aimed at current healthcare professionals, who are interested in learning more about the role of clinical bioinformatics and will also be applicable to people with an interest in the application of genomics in healthcare. It is not essential to have previous experience or knowledge of bioinformatics or genomics although medical terminology is used and the course is designed to be applicable to practising healthcare professionals.

Frequently asked Questions:

When does teaching start on each on these units?

Some units are delivered during semester 1 (September onwards) whereas others are delivered in semester 2 (February onwards). See page 9 and 10 of this brochure for more details on specific units. Please note that the dates indicate taught time rather than the full lenght of the unit. This is because Translation Manchester students are not required to submit assignments.

When can I expect to hear the outcome of my application?

All applicants should expect to hear the outcome of their application within 2 weeks of the deadline.

How is the decision made on who to offer places to?

The Translation Manchester Team and Academic Leads will review applications and places will be offered based on how the skills gained through the training will be implemented in the applicants' ongoing research. Teaching capacity and the funding we have available for the scheme will also be considered in the decision-making process.

How do I access the online course?

After accepting a place on the scheme you will be asked to fill in a registration form and will be enrolled on the awarded units. The course materials will be accessible through blackboard or canvas.

Do I have to take part in the assessments?

Individual assessments are not compulsory for Translation Manchester participants. You must not submit coursework unless the unit co-ordinator says otherwise. If you wish to take part in the assessments, or receive feedback on a piece of work, please contact the unit co-ordinator after you have been enrolled on the course, including translation@manchester.ac.uk in your email. For some units, assessments will be marked at the discretion of the unit co-ordinator. Please check out Terms and Conditions in each unit's description.

Participation in group work and online group discussion forms is compulsory, unless the unit co-ordinator says otherwise.

Frequently asked Questions:

Do I need to submit an application to take part in the MOOCs?

You do not need to submit an application form to take part in the free online MOOCs, however we ask that you notify us by email if you have registered for a MOOC course and we ask that you complete the end of training feedback report.

How much time do I need to commit to the training?

This varies between units, read the details on each page of this booklet and follow the 'more details' links in the brochure to find out the time commitment for a specific unit.

How are the teaching fees associated with my place on the scheme paid?

Translation Manchester will make the necessary arrangements for the teaching fees to be paid from the TPA budget.

My supervisor is on annual leave and won't be able to provide a statement of support before the application deadline. Can I still apply?

In this case you can apply without the statement of support, but please notify your supervisor that you have applied for the scheme and provide the name of your supervisor in your application. If necessary, Translation Manchester can approach you supervisor after the application deadline has passed.

How many places are available on each on the units?

Capacity on each of the unit is variable and will be determined by the number of students enrolled on the course.

If I am offered and accept a place on the scheme, what happens next?

After we offer you a place in the programme you will receive an offer letter from the central admissions team. You will be asked to register as a student to the university using the student registration form. As part of this you will need to complete a right to study form and a criminal records check. After your registration is complete you will be enrolled onto the course units of your choice and will be able to access the online teaching materials through blackboard. More details about the registration process will be made available when we offer you a place.

Frequently asked Questions:

My current contract ends during the teaching period of the unit I am interested in, can I still apply?

You cannot apply for a unit if your contract does not cover the duration of the teaching period at the time of applying to the scheme.

Will I be asked to provide feedback at the end of my participation in the scheme?

Yes, you will be asked to complete an end of training report. This is a compulsory requirement for taking part to this scheme.

Will there be any face-to-face tutorial/workshops/ practicals or lectures held on campus that I am expected to attend?

Some units might include face-to-face sessions, The PGCert and MPH unit are delivery entirely online. For other unit follow the 'more details' link in the brochure to find out more.

If you have any further questions, please email us **translation@manchester.ac.uk**

TranslationManchester

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