

MSc in Precision Cancer
Medicine
Course Handbook
2020–2021

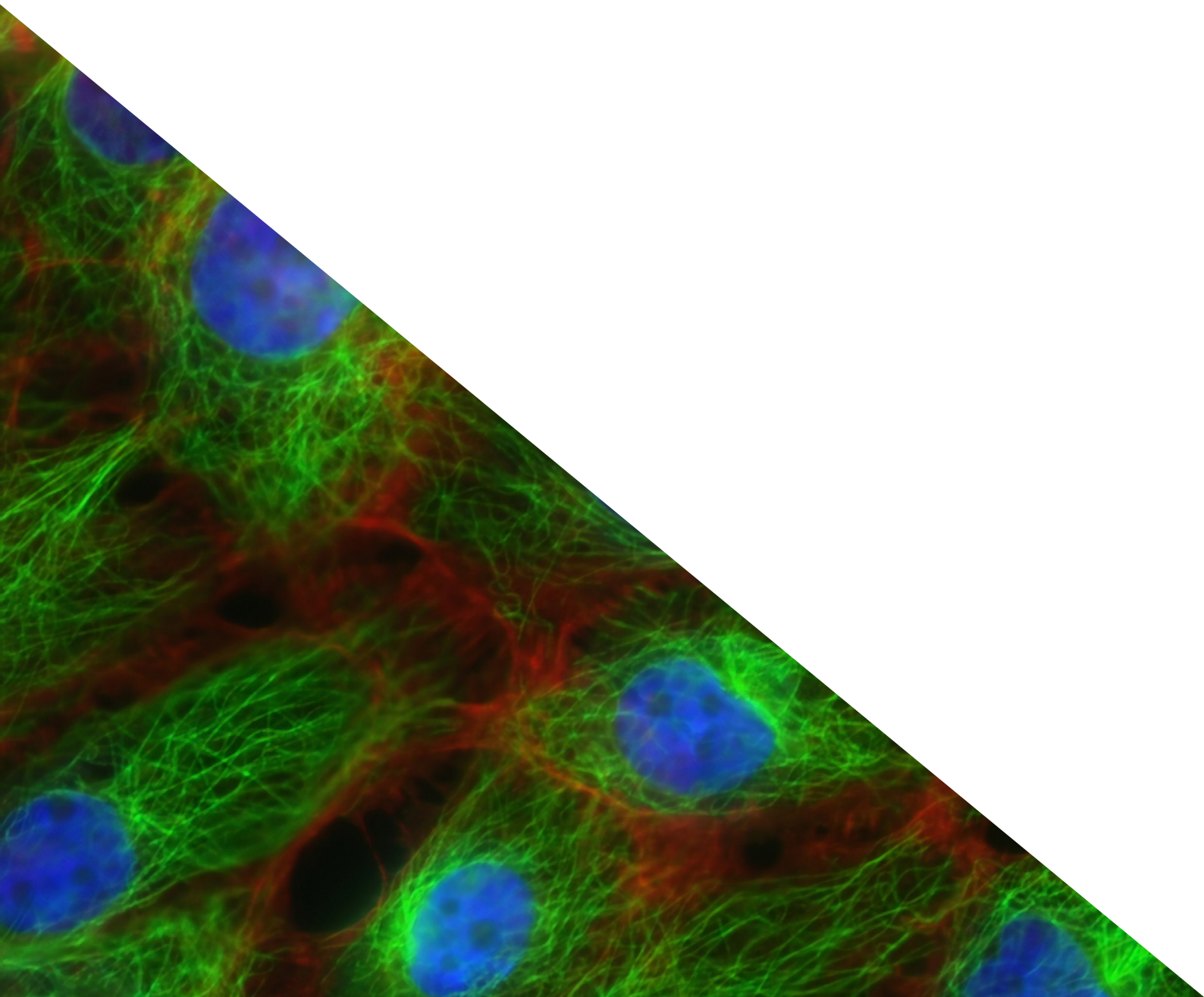


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Foreword

1.1	The Handbook
	This handbook applies to students starting the MSc Precision Cancer Medicine course in Michaelmas Term 2020. The information in this handbook may be different for students starting in other years.
1.2	Version Number
	Version 1.0, 2020
1.3	Examination Regulations
	The Examination Conventions relating to this course are available on the course Canvas site and in Annexe 2 of this Handbook. If there is a conflict between information in this handbook and the Examination Conventions then you should follow the Examination Conventions. If you have any concerns please contact Jane Johnson at the Department of Oncology at graduate.studies@oncology.ox.ac.uk .
	The information in this handbook is accurate as at 1st October 2020; however it may be necessary for changes to be made in certain circumstances, as explained here .
	If such changes are made, the department will publish a new version of this handbook together with a list of the changes and students will be informed.

1.4 Welcome from the Course Directors

We are very happy to welcome you to the MSc in Precision Cancer Medicine at the Department of Oncology. This new MSc course has been established to provide clinicians and scientists with an in-depth insight into the current state-of-the-art omics technologies and their applications in translational research and clinical diagnostics.

The different modules will enable students to use genomics and other omics data to their advantage with a focus on applications to cancer research, statistical methodologies and computational biology. Students will be given the knowledge for trouble shooting and understanding the limitations of the different approaches. They will also understand the principles behind a meaningful data interpretation and develop an awareness of ethical challenges and health economics considerations.

The aim is to offer training to scientists to allow them to make best use of “big data” for their research, and that will ultimately enable clinicians to integrate this knowledge into the clinic in a step towards personalized medicine. For some students, this course may also serve as a preparation for DPhil studies.

The course is taken as a two-year, part-time taught course in Precision Cancer Medicine and leads to an MSc awarded by the University of Oxford. The MSc course consists of eight modules that are taught online, a residential school of one week and a research project.

The taught content of this course is reviewed and updated annually to include new information. Students who qualify for the MSc degree will have obtained a high level of knowledge of Precision Cancer Medicine principles, information, and practical techniques.

The purpose of the handbook is to fully inform you of the key information required for both successful study on the MSc in Precision Cancer Medicine and to outline the resources and supervision within the Department, and other guidance available at the University of Oxford.

We wish you all the best for these forthcoming years.



[Professor Anna Schuh](#)
MSc Course Director



[Professor Sarah Wordsworth](#)
MSc Course Director

1.5 Useful Department Contacts and Links

Prof Anna Schuh, Course Director
Email: anna.schuh@oncology.ox.ac.uk
Tel: +44 (0)1865 220356

Prof Sarah Wordsworth, Course Director
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Oncology Graduate Studies Office:
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Mrs Jane Johnson, Research Training and Development Manager
Email: jane.johnson@oncology.ox.ac.uk
Tel: +44 (0)1865 617017

Mrs Charonne Prosser, Graduate Studies Administrator
Email: graduate.studies@oncology.ox.ac.uk
Tel: +44 (0)1865 617410

Links and other useful contacts:

Link	Description
Department of Oncology	Department of Oncology website
MSc Canvas Course Site	The Virtual Learning Environment for the Course (VLE), Canvas. All the course specific content can be found on here
Oncology Student Canvas Site	Canvas site for all Oncology Students. Department specific information, guidance, and training can be found on here
Examination Regulations	The Examination Regulations for the MSc
Examination Conventions	The Examination Conventions for the MSc
Wolfson College	Information and contacts for Wolfson College students
St Anne’s College	Information and contacts for St Anne's College students
University Student Handbook	General information and guidance to help you to make the most of the opportunities on offer at the University of Oxford. It also provides you with formal notification and explanation of the University’s codes, regulations, policies and procedures

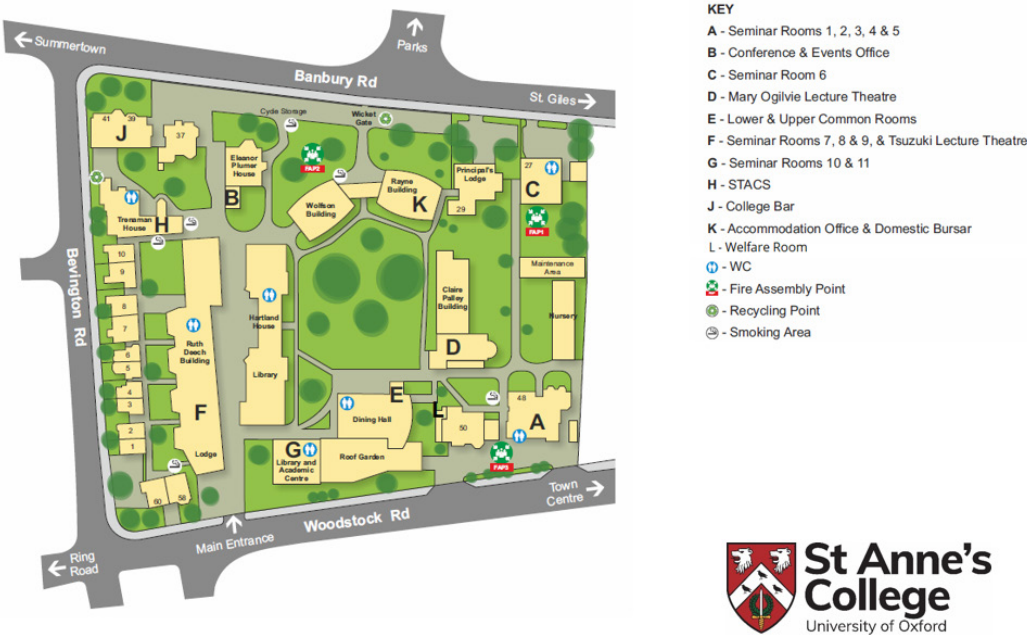
1.5 Useful Department Contacts and Links continued

Link	Description
Central IT Services	For If you have problems with your IT ac- counts. The first place you go for help should be the IT Support Staff in your college or department. Departmental IT help contacts: Greg Blow & Tom Lewis
Oxford Libraries	Information about The Bodleian Libraries at the University of Oxford and useful contacts. Search Oxford Libraries online (SOLO) - the main search engine for library collections across Oxford The Medical Sciences outreach librarians are: Nia Roberts Eli Harriss
Disability Advice Service	Learn about the Disability Advisory Service, how to make an appointment or attend a drop in session, and find contact details for disability contacts across the University. Departmental Disability Lead contact: Jane Johnson
Oxford Students' page	Useful for everything including information for new students, Oxford Life, Welfare & Well- being, and Graduation and leaving Oxford
Oxford Student Union	Oxford SU is the representative body for all University of Oxford students and their direc- tion and ideas are led by their student mem- bers
Mature students' page	Learn about the support on offer to help you extend your qualifications, improve your em- ployment prospects or indulge in an interest for its own sake

1.6 Teaching Locations

Teaching takes place online via our Virtual Learning Environment (VLE), [Canvas](#).

The residential school will be held at St Anne's College, Woodstock Road, Oxford OX2 6HS. (Tel: +44 (0)1865 274800).



1.7 Key Dates

University Term dates 2020/21:

	Start	End
Michaelmas Term	Sunday 11 October 2020	Saturday 5 December 2020
Hilary Term	Sunday 17 January 2021	Saturday 13 March 2021
Trinity Term	Sunday 25 April 2021	Saturday 19 June 2021

Please note that some MSc teaching activities take place outside these dates, so please check the course timetable for more details.

Assessments and examinations:

Formative assessments

Formative assessments will take place during each module. These will generally take the form of small written tasks, quizzes, presentations and group work/discussions. Feedback will be provided to support learning and development.

Please note that formative assessments do not contribute to the final mark.

Summative assessments (do contribute to final mark)

Assessment	Deadline
Extended Essay (15%)	Year 1, Trinity Term (11th June 2021)
Problem-solving Assessment (15%)	Year 1, Long vacation (6th August 2021)
Examination (30%)	Year 2, Hilary Term (Mid- to Late March 2022)
Dissertation (40%)	Year 2, Long vacation (Mid-August 2022)

Details of the above assessments will be uploaded to the MSc Precision Cancer Medicine Canvas site.

2

The Course Content and Structure

2.1 Overview

The University Awards Framework (UAF) is an overarching description of the qualifications and awards which the University offers. It positions those qualifications at the appropriate level of The Framework for Higher Education Qualifications of UK degree awarding bodies in England, Wales and Northern Ireland (FHEQ) and considers the qualification characteristics which form part of the Quality Code. Further details are available [here](#).

This handbook covers the 24-month Master of Science (MSc) in Precision Cancer Medicine, FHEQ Level 7.

2.2/3 Course aims and learning outcomes

The overall learning objective for the course is to provide students with the multidisciplinary skillset and knowledge required to design, conduct and lead precision medicine research, and to deliver precision medicine in the health service.

The course will:

- provide technical knowledge and an in-depth scientific background in genetics, bioinformatics and statistics
- raise awareness of the societal implications of precision cancer medicine with a focus on ethics and health economics
- introduce students to clinical interpretation, and experimental approaches for validation
- foster research skills, in particular critical appraisal and discussion of research findings, with the aim of bringing students to a position to apply for DPhil/ PhD positions on graduation

Students will learn to understand the basic principles of Genomics and Precision Medicine; how genomic changes underlie cancer and which of these may be targeted for therapy. They will acquire knowledge of laboratory and imaging techniques, their applications and limitations with a focus on whole genome sequencing and how omics data can be interpreted with the help of statistics and clinical bioinformatics. Furthermore, students will be made aware of ethical and regulatory challenges in Precision Medicine including data security, incidental and secondary germline findings as well as health economic and resource allocation issues. After completion of this MSc students will be able to interpret clinical Precision Medicine results and design experiments as well as produce Precision Medicine data from a range of sources while keeping the strengths and limitations of different techniques in mind.

Students will also be encouraged to develop critical thinking including the assessment of scientific quality and improve the efficacy of their oral and written communication with scientists and lay audiences.

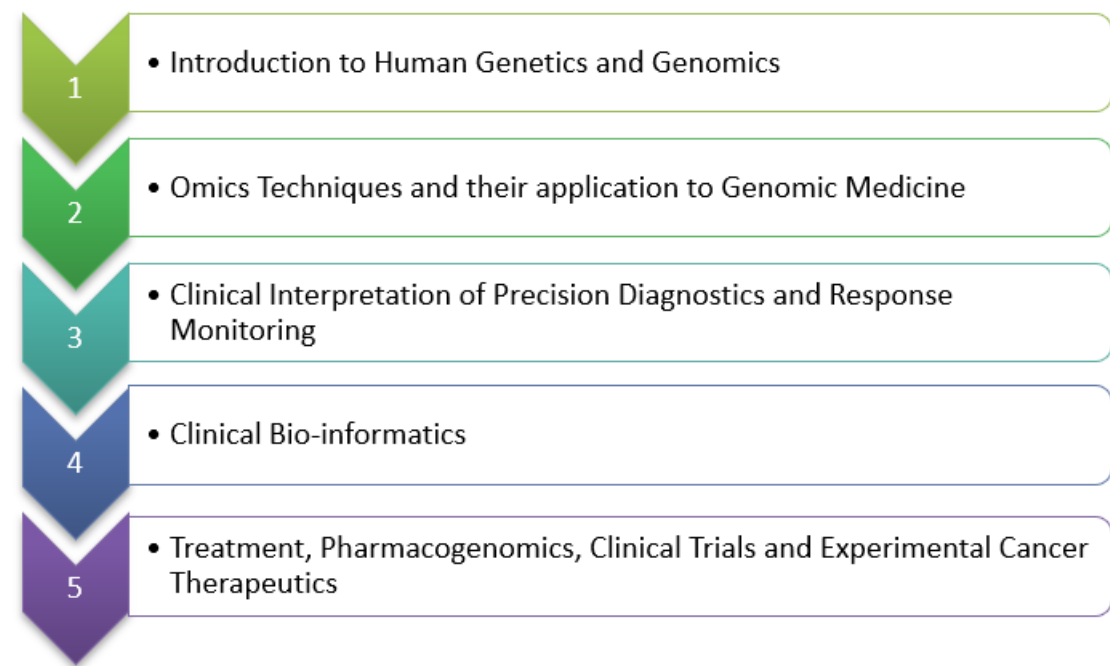
After completion of all modules, students will have the opportunity to implement their new skills by undertaking a research project resulting in further enhancement of their communication skills and in the case of a laboratory-based project develop their practical research skills.

2.4 Course structure and description

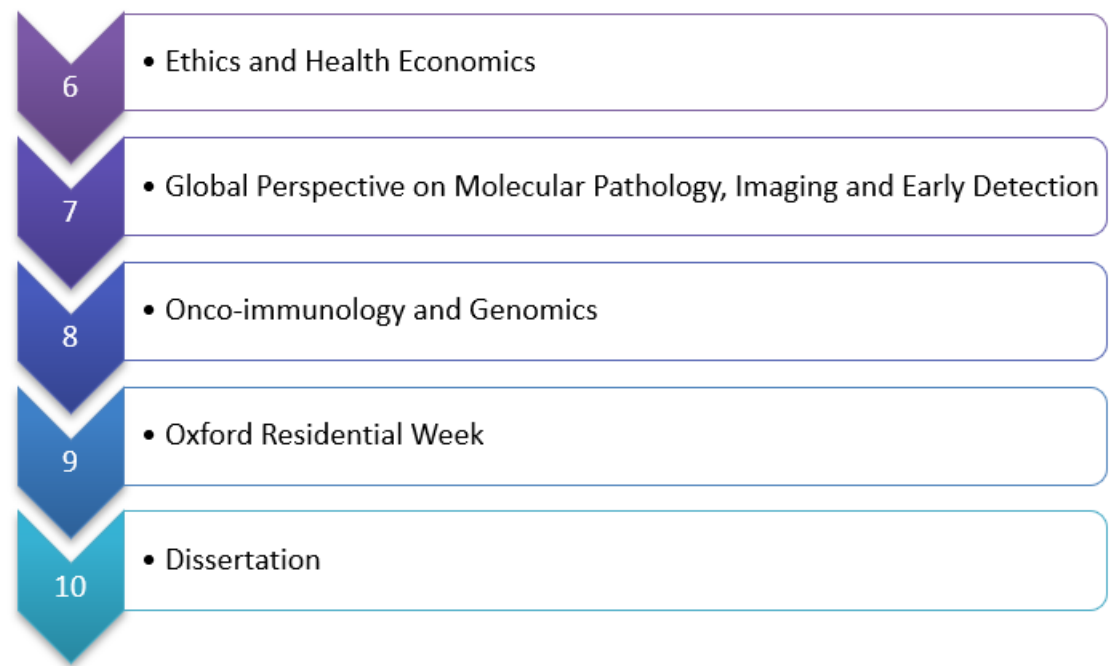
An overview of the two-year programme is shown below, including the eight modules studied by all students.

In addition, Module Zero will be available to all students from September of year 1 (once they have completed the first stage of registration). The aim of Module Zero is to ensure students have a basic knowledge of cell biology and genetics which they will need before starting the course. It is not compulsory and will remain available throughout the course.

Year 1:



Year 2:



As the course is studied online and remotely, the modules are not tied strictly to Oxford terms, although the course will be contained within 2 academic years. Modules are nominally 7 weeks long, with the module’s discussion groups delivered within that period; however, the students may choose to adjust their personal study to fit around professional commitments. There is a break between modules, to give students a rest from scheduled coursework, and prioritise work, family, or other commitments. Each module consists of 7-9 lectures depending on the need and requirements for the topic, plus self-study, and will require approximately 15-20 hours of work per week by students (depending on their level of prior knowledge). Each module has an Oxford-based lead and co-lead who are expert in the module’s topic.

The residential component consists of a week’s course at Oxford, hosted by St Anne’s College, which includes consolidation sessions for modules, revision sessions and a written formal exam. This takes place towards the end of Hilary Term (March) in the students’ second year, after which they focus on a dissertation topic of their choice. The aim of the dissertation is to ensure that students have a good understanding of research practice and study design. The dissertation will be supervised by an appropriate Oxford researcher, and may consist of wet lab work, data analysis, extended essay, or literature review. Planning for the dissertation begins at the start of the students’ second year, with the majority of the work being done after the residential and examination, in the second half of the second year. Students will have access to dissertation supervision for the duration of their final year.

2.5 Syllabus

Details of the teaching syllabus for individual modules is listed below.

Information relating to the module schedule, dates and times of tutorials, and reading lists will be provided in the course [Canvas site](#).

Module 1: Introduction to Human Genetics and Genomics

Module lead: Dianne Newbury

Module co-lead: Alistair Pagnamenta

Lecturers: Dianne Newbury, Alistair Pagnamenta, Peter McHugh, Eric O'Neill

Indicative Content

- Architecture of the human genome and genetic variation within it
- DNA sequence variation, type and frequency e.g. single nucleotide variants, small insertions and deletions, copy number variation, rearrangements and tandem repeats
- How variation arises and its extent in populations (e.g. 1000 Genomes)
- Gene regulation: enhancers, promoters, transcription factors, silencers
- Epigenetics and imprinting
- Mutational mechanisms: how different types of DNA variants affect gene function or expression to cause disease; correlation of genotype with phenotype
- Concepts of heterogeneity and pleiotropy
- Modes of inheritance for clinical manifestation of human variation

Learning Outcomes

By the end of this module the student will be able to:

1. Discuss the human genome structure and the properties of DNA
2. Critique genome architecture and its variation across human populations
3. Critically evaluate the regulation of gene expression, transcription and translation
4. Appraise and interpret variation in genome structure and sequence in the context of physiological function and disease
5. Discuss and analyse epigenetic modifications and imprinting and its role in disease
6. Correlate genetic markers to phenotype and interpret output of association studies both for dichotomous and quantitative traits
7. Understand the specifics of cancer genomics including the concepts of subclonality and clonal evolution, cancer predisposition, DNA damage response and signaling pathways

Module 2: Omics Techniques and their application to Genomic Medicine

Module lead: Francesca Buffa

Module co-lead: H  l  ne Dr  au

Lecturers: Francesca Buffa, H  l  ne Dr  au, Christine Blancher, Anthony Cutts, Dawn O'Reilly, Laura Lopez-Pascua, Alessandro Barberis

Guest speaker: Benedikt Kessler (Target Discovery Institute)

Indicative Content

- Basis of genotyping and detection of genetic variation: whole exome and whole genome sequencing, including library preparation methods, sequencing chemistries and platforms
- Brief overview of methodologies for detecting base substitutions (SNV), small insertions and deletions (indels), copy number variants (CNV) or rearrangements, to include Sanger sequencing, pyrosequencing, ARMS, MLPA, qPCR, microarray
- Genomic testing strategies as: gene focused, multiple genes, or whole genome or exome, and for detection of sequence, copy number or rearrangements
- Additional techniques: expression microarrays and RNA sequencing, proteomics, metabolomics
- Overview of data generated with the different techniques and bioinformatic approaches to their analysis

Learning Outcomes

By the end of this module the student will be able to:

1. Describe and critically evaluate a range of up-to-date genomic technologies and platforms used to analyse targeted parts of the genome or whole genomes
2. Discuss the application of other techniques (for example array comparative genome hybridisation, MLPA, qPCR) commonly used to interrogate genomic variation in clinical settings
3. Appraise and select appropriate technology platforms for applications in medical genomics either for research or medical diagnostic purposes
4. Discuss how these techniques can be applied to RNA sequencing, metabolomics and proteomic analysis
5. Discuss approaches to the bioinformatics analysis and interpretation of 'omics' data
6. Critically evaluate the different 'omics' technologies and platforms and their application to medicine and the impact of Personalised medicine

Module 3: Clinical Interpretation of Precision Diagnostics and Response Monitoring

Module lead: Anna Schuh

Module co-lead: Niamh Appleby

Lecturers: Anna Schuh, Angela Hamblin, Niamh Appleby, David Church, Laura Lopez-Pascua, Hélène Dréau, Benjamin Fairfax, Dimitris Vavoulis, Teena Cranston

Guest speaker: Professor Nick Cross (Professor of Human Genetics, Southampton University)

Indicative Content

This module covers the identification and development of molecular testing and its application in clinical oncology and haematology, supported by examples from specific cancers. Students will learn the principles underlying a selection of molecular tests, the steps required in data interpretation and how test results influence the patient journey. The module provides an overview of the clinical, scientific, quality assurance and regulatory frameworks guiding laboratory testing and clinical interpretation of -omics data.

Learning Outcomes

By the end of this module the student will be able to:

1. Understand the process of developing a biomarker into a diagnostic test. Critically appraise the types of tests available with reference to guidelines for test standardisation and clinical application with reference to
 - a. Chronic Myeloid Leukaemia and BCR-ABL
 - b. Chronic lymphocytic leukaemia and TP53
2. Recognise the potential of precision diagnostics in resource limited healthcare settings and global health
3. Understand the potential of novel diagnostic technologies to alter the patient journey and clinical decision making practices. Be able to discuss examples with reference to
 - a. Whole Genome Sequencing
 - b. Minimal residual disease testing
 - c. Non-invasive biopsy such as circulating tumour DNA
4. Recognise the potential of precision diagnostics in resource limited healthcare settings and global health.
5. Specifically for sequencing based testing,
 - a. Understand the principles of quality control of sequencing data
 - b. Describe the steps undertaken after sequencing to convert raw data into a clinical report including
 - i. Quality control
 - ii. Alignment to the reference genome (and choice of reference)
 - iii. Calling and annotating variants
 - iv. Variant filtering strategies
 - v. Describe how the pathogenicity of a variant is determined
 - c. Appreciate the limitations of the above strategies
6. Appreciate the role of the different regulatory frameworks governing genomic medicine in clinical and research practice from informed consent, professional practice guidelines, tissue handling regulations and clinical laboratory accreditation systems. For example
 - a. CLIA; IsoStandards,
 - b. the UK's Human Tissue Act and Information Governance.
 - c. American College of Medical Genetics and Genomics (ACMG)
 - d. the American College of Pathologists and the Global Alliance for Genomics and Health (GA4GH).
7. Better understand the potential and limitations of national genetics testing strategies using the example of Genomics England in the UK
8. To be able to critically appraise the different risk prediction methods used in clinical practice and to understand the future of risk prediction for early detection of cancer or relapse after treatment.

Module 4: Clinical Bio-informatics

Module lead: David Sims

Module co-lead: Kate Ridout

Lecturers: David Sims, Kate Ridout, Hélène Dréau, Laura Lopez-Pascua, Adam Burns, Kevin Rue-Albrecht

Guest speakers: Alona Sosinsky (Genomics England), Pauline Robbe (RIKEN institute, Japan)

Indicative Content

The main topic in this module is the computational analysis of DNA sequencing data (including whole genome sequencing, whole exome sequencing and targeted sequencing) to identify different types of genetic variants.

- Introduction to command-line Linux
- Processing short-read DNA sequencing data including raw sequence quality control, aligning reads to a reference genome and post-alignment quality control
- Computational tools for identifying single nucleotide variants and short insertions and deletions (indels) e.g. GATK
- Annotation of variants using established databases and *in silico* tools for pathogenicity evaluation, and familiarity with relevant analysis programs
- Variant quality control and appreciation of the factors contributing to variant reliability
- Filtering strategies to prioritize potentially causative variants, incorporating both clinical data and using publicly available control data sets
- Calling large genomic alterations (structural and copy number variants) and interpreting them in a cancer context
- Overview of tools and workflows to analyse RNAseq gene expression data
- Overview of future strategies and technologies in cancer diagnostics

Learning Outcomes

By the end of this module the student will be able to:

1. Appreciate the processing and analysis steps that raw sequencing data go through in order to establish the presence or absence of genetic variants.
2. Understand the limitations of the analysis, and the potential for results to change as technology, algorithms and databases improve.
3. Interrogate major public data sources, e.g. of genomic annotations, protein sequences, known variants, sequence conservation, and be able to integrate with clinical data, to assess the pathogenic and clinical significance of genetic variants.
4. Acquire relevant basic computational skills and understanding of computational methods for handling and analysing sequencing data for application in both diagnostic and research settings.
5. Gain practical experience of processing sequencing data using bioinformatics pipelines through the Genomics England programme.
6. Critically evaluate bioinformatics tools and public data sources.

Module 5: Treatment, Pharmacogenomics, Clinical Trials and Experimental Cancer Therapeutics

Module lead: Simon Lord

Module co-lead: Murali Kesavan

Lecturers: Graham Collins, Jane Holmes, Murali Kesavan, Neel Patel, Simon Lord

Indicative Content

- Basic concepts of clinical trial design
- Genomic basis of: drug reaction, drug efficacy, ethnic differences in both these
- Use of genomic information for targeted drug development
- Precision cancer medicine as a tool to understand drug resistance and identify rational combinations
- Companion diagnostics
- Utility of imaging and circulating biomarkers in drug development

Learning outcomes

By the end of this module the student will be able to:

1. Identify and evaluate clinical trial designs
2. Recognise the challenges and evaluate designs for pharmacodynamic clinical studies
3. Identify the different types of current and emerging biomarkers in clinical trials
4. Understand the challenges in developing companion biomarkers and diagnostics in drug development
5. Understand how pharmacodynamic and pharmacokinetic assays in clinical studies can inform dosing and identify markers of drug toxicity
6. Understand the challenges in taking new drugs to patients

Module 6: Ethics and Health Economics

Module lead: Sarah Wordsworth

Module co-lead: TBC

Lecturers: Sarah Wordsworth, Grant Vallance, Mike Parker, James Buchanan, Rositsa Koleva-Kolarova

Indicative Content

This module will deal with the ethical, regulatory and health care payer challenges. This includes diagnostics accreditation, health economics, health technology assessment (understanding how to use health care resources in an effective and cost-effective manner) and ethical considerations in research and implementation of precision medicine.

- Ethical principles for precision medicine including but not limited to privacy, confidentiality, autonomy, consent, justice.
- Comparison of clinical ethics and research ethics situated in the context of precision medicine.
- The balance of ethical principles with respect to individuals and populations/society in the context of precision medicine.
- Understanding ethical principles in the context of complexity and uncertainty. An introduction to economic evaluation in genomic medicine
- Selection of appropriate economic models and understanding of their effect on the public health
- Summary, critical analysis and dissemination of results of appropriate tests
- Justification of economic based decisions in the field of genomics.

Learning Outcomes

By the end of this module the student will be able to:

1. Identify, explain and apply different ethical principles such as confidentiality, autonomy, informed consent and justice to scenarios within precision cancer medicine.
2. Apply different theoretical, value and policy-making approaches to real life issues and case studies in precision medicine. Reflect critically on the relationship between personal values and societal values in the context of emerging genomic technologies and precision medicine
3. Apply skills in reasoning (including methods of ethical argumentation, conceptual and logical analysis and case comparison) in order to analyse ethical issues in precision cancer medicine and to make sound ethical judgements within different practical decision-making contexts.
4. Describe the need for health economic evaluation in allocating health care resources in precision medicine.
5. Understand the different types of economic evaluation.
6. Appreciate the role and limitations of 'quality of life' studies in outcome evaluation
7. Make informed choices between treatment options based on measures of disease burden such as quality-adjusted life years.
8. Critique different types of economic evaluation in the context of precision medicine.

3

Teaching and Learning

3.1 Organisation of teaching and learning

The content is provided in the form of online core lectures, recorded guest lectures, tutorials, moderated Q&A sessions, and online quizzes. The course has a Teaching Fellow, who is responsible for co-ordinating lectures, designing, organising and running the online tutorials, setting exam questions, and handling day-to-day academic queries from course students.

Teaching resources are made available to students via the University's virtual learning environment (VLE) platform, Canvas. An academic year planner will be made available to students, along with the schedule of tutorials for each year (second year to be released further down the line), to aid planning. These can be found in the Induction & Student Services page on the MSc Course Canvas page.

If you have any issues with teaching or supervision please raise these as soon as possible so that they can be addressed promptly. Details of who to contact are provided in section 7.2 complaints and appeals.

Lectures

Each module consists of approximately 6-9 1-hour lectures (split up into shorter 10-30-minute recordings) depending on the requirements of the topic. Lectures are pre-recorded, and made available to students at the start of the module, along with module reading materials. Students then work through all the video and written materials at their own convenience. A variety of activities are used to test understanding and develop students' thinking (such as multiple choice quizzes, case studies), to create variety and maintain student engagement.

Tutorials

Students will also join online group tutorials. These tutorials are facilitated and moderated by the module lead and/or course's teaching fellow. There are typically 3 tutorials for every module and these will run at least twice at different times of the day to accommodate different time zones. This provides opportunity to discuss topics in depth, and review student assignments, as in a standard tutorial in Oxford.

They will be conducted via Zoom, or alternative platform with equivalent functionality and performance.

Self-Directed Learning (SDL)

Students are expected to work through all lectures on their own and prepare specific questions in case any topic is unclear to them.



Q&A sessions

Q&A sessions will also be held at the end of the majority of modules, co-ordinated by the module leads and teaching fellow. The aim of these Q&A sessions is to provide the student with additional sources of information regarding specific aspects of the course and to clarify any issues that might have arisen from the lectures.

One-on-One Support

Students can request one-on-one support from the teaching fellow, to discuss any academic issues they may wish to raise. There will be in the form of 3 bookable 20-minute slots every week. These will be held via Microsoft Teams or Zoom. Students can book one of these slots via the Course Canvas site, via the [Signup page](#).

3.2 Research Project

The aim of the dissertation is to ensure that students have a good understanding of research practice and study design. The dissertation content is designed to assess students on their academic ability, critical thinking, originality and their understanding of the pragmatics of research.

A list of dissertation projects and supervisors will be provided to students in the Michaelmas term of their second year. Dissertations could be based on data analysis, literature review, a small primary research project or pilot for a larger piece of research, or an extended essay (for example, on ethics, or clinical trial design in precision medicine). These desk-based dissertations can be undertaken anywhere in the world; students will not come to work in Oxford, and will be supervised remotely.

The list will also include a limited number of laboratory projects based in a supervisor's Oxford laboratory. This offer aims to accommodate students who wish to come to Oxford and whose logistics allow them to do so. Because of the nature of the laboratory work, we expect these projects will be a full-time block of 12 weeks. A small number of bursaries will be available to assist with the cost of travel to Oxford and accommodation costs. Once the project and supervisor list has been released we would advise the student contact the suggested supervisor to ask any further questions and register their interest.

Students may also propose their own dissertation project. They will need to develop a proposal for review by the course organising committee, by a specified date in Michaelmas Term of their second year. Before approving an independent proposal, the course organising committee will consider:

- Whether the project is appropriate in scope for a 10,000-word Masters dissertation

- Availability of an Oxford academic who is prepared to supervise the project
- Requirement for local oversight (for example in the student's workplace)
- Risk assessment
- Ethical considerations
- Intellectual property, data ownership and publication rights

Students are encouraged to select a dissertation topic relevant to their work, to promote commitment to the dissertation from both the student and their employer. Once the projects are assigned, students will work with their dissertation supervisors during Michaelmas/Hilary Term to refine a research question that falls within the project's objective, and fits with the student's skill set and professional interests. The process of developing the specific project, rather than being handed a pre-prepared one, provides a valuable learning opportunity for students to develop their skills in research planning and design.

Students will have access to supervision during their second year, with the majority of the research work being done in the spring and summer, after the course exam. Guidelines for remote interaction with the Oxford supervisor will be provided.

Guidance on the preparation of the dissertation is provided in the Examination Conventions. Further guidance on the format will also be provided by that start of Michaelmas Term, year 2.

Examples of dissertation projects:

Lab-based

- Development of a next generation sequencing methodology to identify poor risk copy number abnormalities in multiple myeloma.
- Development of a highly sensitive method for detection of resistance mutations from cell-free circulating tumour DNA.

Desk-based

- Development of a bio-informatic pipeline and comparison of results from short and long-read sequencing of clinically relevant immunoglobulin rearrangements in chronic lymphocytic leukaemia.
- Critical Review (literature and through interviews of relevant stakeholders) of the national and international Big Data Initiatives in Cancer and Haematological Malignancies.
- Systematic literature review of patient and public preferences for outcomes associated with genomic sequencing.

Please note these projects examples are given as a guide and will not necessarily be an option to choose from once the project lists have been released.

The role of your dissertation supervisor is to:

- Advise, guide and support you in all aspects of your research project/ dissertation
- Have regular meetings, at a minimum once every two weeks (particularly during Trinity Term of Year 2)
- Report on the student's progress
- Identify the student's training needs

3.3 Expectations of Study

Students are expected to spend considerable time undertaking self-study to complement the lecture material. Students are responsible for their own academic progress. There are breaks between each module, with an extra week for Christmas and a longer break during August of Year 1. Following the Written Exam in March of the second year, the work pattern during the dissertation project time is determined by the requirements of the research and must be in agreement with the project Supervisor. Most projects will be over a 20-week period, working part-time around the student's work commitments, although a small number may be based in an Oxford laboratory, and these are expected to be full-time over 12 weeks. This is a guide only and will vary between individual students

3.4 Responsibilities of the student

1. It is the students obligation to act as a responsible member of the University's academic community.
2. The student should take ultimate responsibility for his or her work programme and endeavour to develop an appropriate working pattern. The student should discuss with the dissertation supervisor the type of guidance and comment which he or she finds most helpful, and agree a schedule of meetings.
3. The student should make the most of the teaching and learning facilities available within the University, as well as facilities for career guidance and development.
4. It is the student's responsibility to seek out and follow the regulations relevant to his or her course, and seek clarification from the Course Director, Teaching Fellow, Graduate Studies Administrator(s), Supervisors and elsewhere if this is necessary.
5. The student should not hesitate to take the initiative in raising problems or difficulties, however elementary they may seem. He or she should ensure that any problems regarding the course are drawn to the attention of the course team so that appropriate guidance can be offered.
6. The student should recognise that members of the course team may have many competing demands on his or her time. The student should hand in any work in good time and give adequate notice of unscheduled meetings.
7. The student should be aware that the provision of constructive criticism is central to learning, and should always seek a full assessment of the strengths and weaknesses of his or her work.
8. During the dissertation project the student should seek to maintain progress in accordance with the plan of work agreed with the supervisor, including in particular the presentation of the required written material in sufficient time for comment and discussion. Both the student and supervisor will want to keep a record of all formal, scheduled meetings. They may well want to agree a record of what has been discussed and decided.
9. If the student feels that there are good grounds for a change of supervisor, this should first be discussed with the supervisor or, if this seems difficult, with the Course Directors or the College Adviser.

4

Assessment

4.1 Assessment Structure

Students will be assessed by various methods during the course that will allow both formative and summative assessment of student progress ([Examination Conventions](#)). Students will have to satisfy the examiners in their online attendance for all modules, completion of formative coursework and attendance at the Residential School (in line with the [Regulations](#)).

Summative assessments:

Assessment	Deadline
Extended Essay (15%)	Year 1, Trinity Term (11th June 2021)
Problem-solving Assessment (15%)	Year 1, Long vacation (6th August 2021)
Examination (30%)	Year 2, Hilary Term (Mid- to Late March 2022)
Dissertation (40%)	Year 2, Long vacation (Mid-August 2022)

Summative assessment methods: All summative assessments contribute to the final mark.

Students will submit two pieces of work for summative assessment during their first year. Topics will be selected by students from a short list of pre-defined questions set by the Module Leads, and will be drawn from the content of Modules 1-5. A choice of titles for both will be published by the start of Hilary Term in year 1.

1. **Extended essay:** 2500 words, submitted after Module 4 (early June). Example essay titles could include:
 - Discuss the pros and cons of whole genome sequencing versus whole exome sequencing.
 - Review the evidence for the relevance of non-coding mutations in the pathogenesis of rare inherited diseases and cancer.
 - Critically appraise the clinical value of molecular monitoring of residual disease in solid tumours and blood cancers.
2. **Problem-solving Assessment:** 2500 words, submitted after Module 5 (early August). Students will submit an assessment that will test their ability to apply the content of the MSc to research and day-to-day clinical and scientific work. Examples of these assessments could include asking students to:
 - Critically analyse a complex clinical data set or case studies

- Undertake a critical analysis of a clinical diagnostic report
- Produce a protocol suitable for delivering DNA sequence findings to patients
- Report of experimental findings written as a research paper
- Write a concise summary of a study research proposal
- Report on clinical practice development
- Prepare a review article for “Bioessays” format

Both of these pieces of coursework will contribute 15% of the final mark. Students will need to integrate material from several modules to achieve a high grade, in line with Master’s level requirements. For more information regarding the marking criteria please check the [Examination Conventions](#).

Exam

The course exam will adhere to Oxford regulations and the framework of the UK’s Quality Assurance Agency for Higher Education (QAA). Exam questions will be prepared by the module leads and co-leads, set by the examination committee and agreed by external examiners. Students will sit the final exam in person towards the end of the residential week, in March of year 2, this allows for the usual University procedures to minimise the risk of plagiarism or other cheating. Students will be required to bring their University card as proof of identity; they will have the opportunity to collect their card during the residential week if they have opted to not have this posted out to them beforehand.

The exam will consist of short written essays. As the materials from modules 1-5 will be tested via the assessed coursework, the exam will focus mainly on material taught in the later modules (modules 6-8) but will also draw on some topics from the earlier modules. Students must receive a grade of at least 50% to pass, and the exam contributes 30% of the final mark.

To prepare students for this exam, they will have the possibility to test themselves by answering multiple choice tests after each individual module. In addition, there will be a face-to-face preparation with module leads during the residential course. We will host a number of online revision tutorials towards the end of February/start of March of Year 2 to help better prepare the students for the examination.

Dissertation

The research project is assessed by evaluation of the written dissertation (10,000 words). Again, an overall grade of at least 50% for the dissertation is needed to pass this last part of the MSc course, and the dissertation contributes 40% of the final mark.

4.2 Feedback on Learning and Assessment

In addition to the formal teaching and assessment, there will be opportunities for informal feedback. We encourage students to create their own chat room and study groups. The teaching fellow and college tutors will be available for any feedback.

Formative assessments have been added to each module. Additional assessments in the form of tutorial essays, literature reviews, in class problem sets, peer marking exercises, peer and lecturer feedback on in class presentations are part of the tutorials and feedback will be given in peer and lecturer feedback on in class presentations are part of the tutorials and feedback will be given in writing or verbally as appropriate.

Written feedback for summative assessments will be provided including an explanation of the role of marks, generic feedback on cohort performance through examiner’s reports, and exam answers used in marking exercises.

4.3 Examination Conventions

Examination Conventions are the formal record of the specific assessment standards for the course or courses to which they apply. They set out how your examined work will be marked and how the resulting marks will be used to arrive at a final result and classification of your award. They include information on: marking scales; marking and classification criteria; scaling of marks; progression; resits; use of viva voce examinations; penalties for late submission; and penalties for over-length work.

The MSc in Precision Cancer Medicine [Examination Conventions](#) can be found on the Canvas site.

The definitive version is at the link above. Modifications will be published to prospective candidates not less than one whole term before the examination takes place or, where assessment takes place in the first term of a course, at the beginning of that term. Students will be informed via email of any changes to the conventions.

4.4 Good academic practice and avoiding plagiarism

University definition: “Plagiarism is presenting someone else’s work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgement. All published and unpublished material, whether in manuscript, printed or electronic form, is covered under this definition. Plagiarism may be intentional or reckless, or unintentional. Under the regulations for examinations, intentional or reckless plagiarism is a disciplinary offence.”

The University definition of plagiarism and link to the Oxford Student’s website guidance on plagiarism can be found [here](#). Please also refer to section 5.2 for further information regarding Academic Integrity.

Students are encouraged not to rely on heavy reuse of review articles as this can lead to a high similarity index score detected by Turnitin (see section 5.2), and the development of habits not in accordance with good scientific and academic integrity. Instead students are encouraged to read widely from many primary sources and to synthesise their own arguments and opinions. This requires good time management, note taking, referencing, research and library skills and information literacy; help can be found on the [Oxford Students’ skills webpage](#).

Further explanatory material is provided in Annex C of the [Examinations and assessment framework \(EAF\)](#).

4.5 Entering for University examinations

The Oxford Students’ website for examination entry and alternative examination arrangements can be found [here](#).



4.6 Examination dates

This course has only one formal examination. The actual date and time will be confirmed in Hilary term of year 2.

[Timetables](#) are published as early as possible and no later than five weeks before the start of the examination. If the timetable is not listed it is not yet available. Refer to the provisional start date from the Examinations entry and provisional start dates document available from the [Examination entry](#) page in the meantime.

4.7 Sitting your examination

Information on (a) the standards of conduct expected in examinations and (b) what to do if you would like examiners to be aware of any factors that may have affected your performance before or during an examination (such as illness, accident or bereavement) are available on the [Student webpage](#).

4.8 External Examiner and Examiners' reports

A list of the examiners responsible for this course can be found in the Examination Conventions. Students are strictly prohibited from contacting external examiners directly. If you are unhappy with an aspect of your assessment then you may make a complaint or appeal (refer to Section 7.2).

Examiners' reports will be made available to students as standard. Please note that certain sections will not have been completed if there are a low number of students and where information on identifiable individuals is recorded this would also be removed.

5

Skills and Learning Development

5.1 Academic progress

Overall responsibility for monitoring and reporting on students' academic progress is held by the Course Directors.

Formal termly reporting is via the use of the Graduate Supervision Reporting (GSR) system.

5.2 Learning development and skills

Study skills

Students who have been away from education for some time may need to refresh or acquire study skills, including topics such as essay writing, referencing, time management, and discussion groups. As needs will vary widely, students will need to take responsibility for their own study skills training. We recommend students make use of Oxford's range of [existing training materials](#), and to discuss any concerns about study skills with their course advisor or college advisors.

Academic integrity

Given the distance-learning format of the course, it is essential that students develop a good understanding of academic integrity, and the importance the University attaches to establishing the authenticity of students' work. Students are required to take the [University's online course](#) for graduate students on avoidance of plagiarism as part of their induction, and to forward their certificate of completion of this training to the course administrator, indicating if they need further clarification. Students are also required to read the University's policy on plagiarism, as part of their induction. This training forms the basis of the declarations related to plagiarism that students will be required to submit with all assessed work.

All assessed work will be uploaded to Turnitin – a widely-used source-matching software which generates an 'originality report'. Early in the course, a piece of submitted work will be put through Turnitin, and the resulting output discussed in the next group discussion, to help students understand what would be recognised as possible plagiarism.

The Centre for Learning and Teaching also run a [Plagiarism awareness and use of Turnitin](#) course, which we recommend all students undergo.

IT skills

Given the nature of online teaching, students will need an intermediate level of IT skills

(i.e. competence with Word, Excel, Powerpoint and use of the Internet), and will need to set up their computer to use the VLE and online conferencing (Zoom or a similar platform). Training and support are available through the [University's IT Services](#).

Students will need to ensure that they have access to appropriate IT resources: specifically, a PC/Mac, webcam and microphone, and a good broadband internet connection. Minimum technical requirements are described [here](#). Practical issues relating to access will be identified during induction discussions with course staff.

Bodleian Health Care Libraries

Training will be provided during induction to navigate the library system in Oxford. We recommend students refer to [existing online training materials](#); this includes videos and LibGuides on a range of topics including research techniques, information skills and referencing software. Students also have access to help from the Medical Sciences outreach librarians, who provide as-needed individual support via email and/or conference call.

Further training on literature searching will be provided before the start of the dissertation work.

5.3 Induction

We will provide a comprehensive induction for students given the distance-learning nature of the course, to ensure they engage with the course from the beginning, understand the standards required, and feel part of the University.

Time is allowed in Week 0 of the students' first year to familiarise themselves with induction materials. The induction timetable will be circulated via email prior to the induction week and will also be made available on the Canvas Course page, within the Induction & Students Services section. This includes an introduction to Medical Sciences Division, to the host department for the Precision Cancer Medicine MSc (Oncology), and to the course. The course orientation will cover key staff and their roles, course content and structure, teaching methods and timetable, and assessment; student support mechanisms, student responsibility, representation, and who to approach with concerns or a complaint will be included.

Skills training as part of induction will include the IT skills and equipment necessary to access the course, academic integrity, and avoidance of plagiarism, and using the Library. Further skills training is available through the university, which students can access depending on individual needs; sources include the University's graduate student webpages, Medical Sciences Graduate School webpages, OLI, and Lynda.com.

Induction material will be in a variety of formats, including recorded lectures, live group introductory sessions, reading material (including this Course Handbook and the Examination Regulations and Conventions) and existing skills training videos or online courses available within the University. Total time required is expected to be 5-8 hours, depending on the level of skills training or additional support needed.

5.4 Opportunities for skills training and development

During the course, students will be encouraged by the course team and their dissertation supervisor to develop a range of transferable skills.

5.5 Opportunities to engage in the department research community

There are many research seminars available within the Department and the wider University that are now recorded and added as podcasts to the University website and are accessible to all.

5.6 Careers information and advice

In addition to advice from the Course Directors and your dissertation supervisor more information on careers can be found at the [University Careers Service](#). There is an extensive range of support for students including workshops and one-to-one appointments. Students will access to the Careers Service for life.



6

Student Representation, Evaluation and Feedback

6.1 Department Representation

The MSc students elect a student representative at the start of Michaelmas Term. This student representative is a member of the termly MSc Organising Committee, the Oncology Graduate Studies Committee and the Divisional Graduate Joint Consultative Committee (GJCC). Course representative contact details can be found on the course Canvas site. An outline of the student representative's role is summarised in [Annexe 1](#).

6.2 Division and University Representation

Student representatives sitting on the Divisional Board are selected through a process organised by the Oxford University Student Union (Oxford SU). Details can be found on the [Oxford SU website](#) along with information about student representation at University level.

6.3 Opportunities to provide evaluation and feedback

The Department recognises that regular student feedback is an essential part of the ongoing development of the course. Feedback will be regularly obtained from a variety of different sources.

Individual feedback:

- All students will be asked to complete a detailed survey at the end of each MSc module. This will be reviewed by the Course Directors. A summary report of feedback will be reviewed by the termly MSc Organising Committee and the Oncology Graduate Studies Committee. Student Representatives will be in attendance at these committees where they will also be able to give a verbal report.
- All students are asked to provide individual feedback via termly reports in the Graduate Supervision Report system (GSR).
- All students will be asked to complete an end of course survey after they receive their examination results.
- Dissertation supervisors will complete a report on each student at the end of the research placement. This is reviewed by the Examinations Board alongside the dissertation and the viva, where appropriate.
- The Chair of Examiners and the External Examiner will provide an annual report on the examination process to the University. These reports will be available to students on the MSc Canvas site.

The day-to-day running of the MSc course is overseen by the Course Directors and through the MSc Organising Committee, which meets three times per year and involves the Course Directors, Research Training and Development Manager, Course Administrator, Chair of Examiners and student representative. The minutes from the committee are reviewed at the Oncology Graduate Studies Committee and added to the MSc Canvas site for students to access.



University wide feedback:

Students on full-time and part-time matriculated courses are surveyed once per year on all aspects of their course (learning, living, pastoral support, college) through the Student Barometer. Previous results can be viewed by students, staff and the general public [here](#).

7

Student Life and Support

7.1 Who to contact for help

Although the Department primarily provides academic support, and pastoral support is primarily provided through your College Advisors, we would like to positively support you with your graduate studies wherever we can. Please do speak to a member of the course team if you are experiencing any difficulties with your studies and we will do our best to support and guide you.

Each student will be allocated an Academic Advisor from Michaelmas Term of Year 1 to support them throughout their entire 2 years of study. Their role will be to provide supervision and mentoring throughout the course of study and monitor the student's progress in academic and skills development relating to the course. The role of the Academic Advisor is:

- Have contact with their assigned students at least twice a term to discuss their progress and identify any problems they may be experiencing with the course material.
- Discuss with their students at an early stage their initial skills, individual learning needs, requirements of the course, and resources available in the University.
- Act as a 'signpost' for their students, guiding them in the direction of other expertise within the department and beyond as necessary.
- Complete and return the online termly Graduate Supervision Report Form on their students' progress, the content of which is known by the students.
- Inform the MSc Course Directors as soon as possible should they have any concerns about the students.

Colleges:

Every college has their own systems of support for students, so please contact your college academic office or visit their website for more information on who to contact and the services available.

Each student will have been allocated either [St Anne's](#) or [Wolfson College](#).

The role of the college adviser is:

- To provide support to you that is independent of the academic department
- To deal with matters relating to hardship
- Provide additional support if you are experiencing difficulty with matters relating to issues other than research work/study

If students are ill and unable to attend required tutorials or keep up with coursework, they should contact the Course Administrator as soon as possible (Refer to 1.6 for contact details).

Details of the wide range of sources of support which are available more widely in the

University can be found on the [Oxford Students' website](#), including items on mental health, physical health and disability.

7.2 Complaints and academic appeals within the Department of Oncology

The University, the Medical Sciences Division and the Department of Oncology all hope that provision made for students at all stages of their course of study will result in no need for complaints (about that provision) or appeals (against the outcomes of any form of assessment).

Where such a need arises, an informal discussion with the person immediately responsible for the issue that you wish to complain about (and who may not be one of the individuals identified below) is often the simplest way to achieve a satisfactory resolution.

Many sources of advice are available from colleges, faculties/departments and bodies like the Counselling Service or the Oxford SU Student Advice Service, which have extensive experience in advising students. You may wish to take advice from one of those sources before pursuing your complaint.

General areas of concern about provision affecting students as a whole should be raised through Joint Consultative Committees or via student representation on the faculty/department's committees.

Complaints

If your concern or complaint relates to teaching or other provision made by the department, then you should raise it with the Director of Graduate Studies ([Professor Eric O'Neill](#)) as appropriate. Complaints about departmental facilities should be made to the Head of Finance and Administration ([Liz Barnes-Moss](#)). If you feel unable to approach one of those individuals, you may contact the Head of Department ([Professor Mark Middleton](#)). The officer concerned will attempt to resolve your concern/complaint informally.

If you are dissatisfied with the outcome, you may take your concern further by making a formal complaint to the Proctors under the [University Student Complaints Procedure](#). If your concern or complaint relates to teaching or other provision made by your college, you should raise it with your college advisor, in the first instance. Your college will also be able to explain how to take your complaint further if you are dissatisfied with the outcome of its consideration.

Academic appeals

An academic appeal is an appeal against the decision of an academic body (e.g. boards of examiners, transfer and confirmation decisions etc.), on grounds such as procedural error or evidence of bias. There is no right of appeal against academic judgement.

If you have any concerns about your assessment process or outcome it is advisable to discuss these first informally with your subject or college tutor, Senior Tutor, Course Director, Director of Studies, supervisor or college or departmental administrator as appropriate. They will be able to explain the assessment process that was undertaken and may be able to address your concerns. Queries must not be raised directly with the examiners.

7.3 Policies and regulation

If you still have concerns you can make a formal appeal to the Proctors who will consider appeals under the [University Academic Appeals Procedure](#).

The University has a wide range of policies and regulations that apply to students. These are easily accessible through the A-Z of University regulations, codes of conduct and policies available on the [Oxford Students' website](#).



8

Facilities

It is recognised that the online nature of this course means that physical facilities will only be accessed by students during the residential week in year 2.

Work space

As the course is largely taught via distance learning students are not allocated desk space. Any students completing an Oxford based dissertation project using Oxford laboratory space will be allocated desk and laboratory space at the beginning of the project.

Examinations

Students sit one written paper in the Examination Schools, at the end of Hilary Term (March) in their second year.

Library

Students will be able to access the University's libraries online; Search Oxford Libraries Online (SOLO) and Oxford Reading Lists Online (ORLO).

IT

The course is delivered via the University of Oxford's virtual learning environment (VLE), Canvas.

There is an extensive network of IT resources and associated support across the University of Oxford. The IT systems within the Department of Oncology are supported by the Oncology IT Services.

IT Services (ITS), is a dedicated University resource which provides training and facilities for students at a variety of IT levels, from beginners to those wishing to learn sophisticated programming languages. IT Services also provides discounted software and virus protection/security packages.

For the tutorials the course will utilise Zoom or an alternative platform with equivalent functionality and performance.

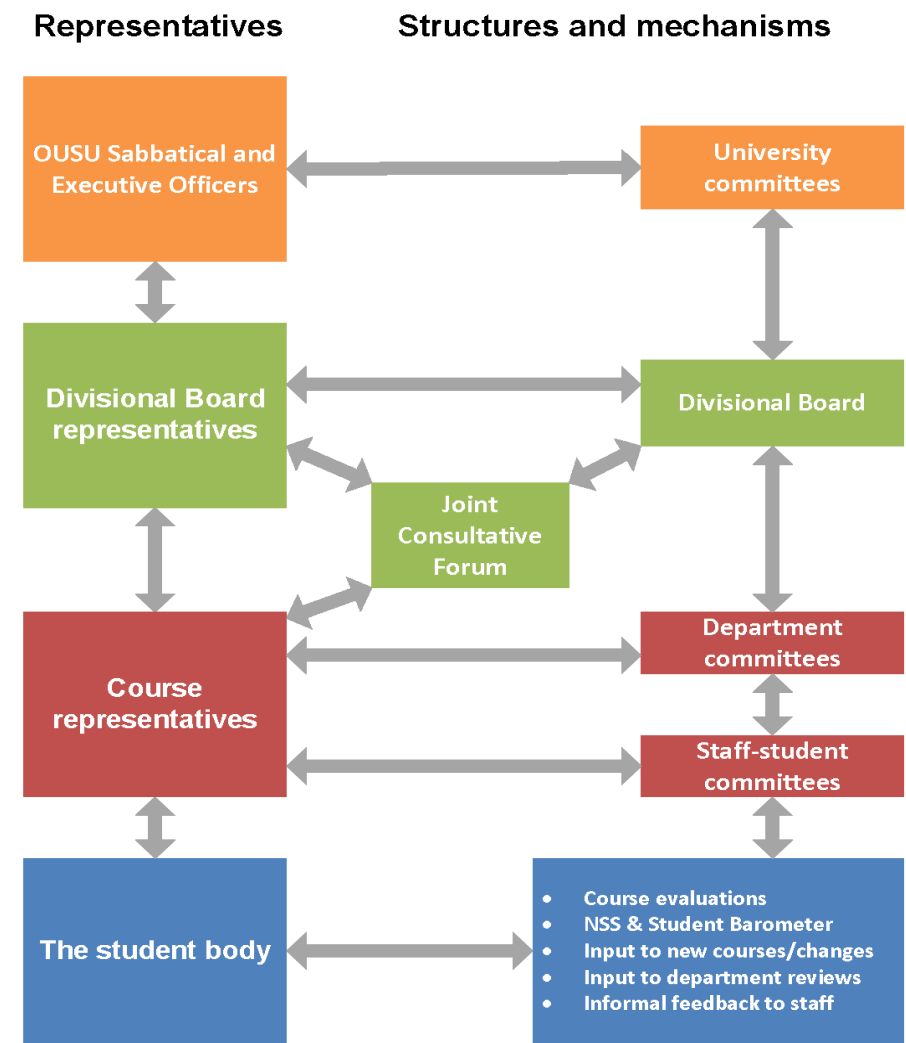
ANNEXE 1: STUDENT REPRESENTATIVE - ROLE DESCRIPTOR

The University welcomes the engagement of students and encourages participation in the governance, evaluation and development of their course of study on such matters as:

- a. changes in regulations;
- b. the review of examiners’ reports;
- c. student feedback;
- d. course delivery and design;
- e. student support, including advice, guidance, facilities, training, and study skills; and
- f. appropriate approaches to individual student concerns.

An elected MSc Student Representative is required to provide feedback to the termly MSc Organising Committee/Course Committee and the Oncology Graduate Studies Committee. Participation need not involve attendance at meetings, although this is preferred for full-time students, written submission and responses to papers are welcomed.

The structure of the student representation system within the University is as follows:



Duties of Student Representatives

Each accredited course should invite the student body to identify a representative [1] to:

1. Act as the focus for feedback from students
 - encourage high response rates to evaluation questionnaires
 - summarise key points raised
 - bring to Course Director’s attention matters not covered in questionnaires or other formal mechanisms
2. Participate in Course Committee meetings [2]
 - comment on completed modules/units
 - advise on plans for future modules/units
 - comment on future offerings of the course (changes in regulations, course delivery and design)
3. Liaise with student representatives from other programmes/courses, in particular those who are members of the Departmental Committees.
4. Act as a focus for communications from the University or Department on matters relating to student representatives.
5. Report back to the students on their course the results of any representations made.

[1] The mechanism for this needs to be appropriate to the course concerned. Formal elections are not required but the invitation should be as inclusive as possible and shared representation encouraged where the duties are unfeasible or too burdensome for any individual student.

[2] Terms of reference need to reflect student participation, with appropriate arrangements for reserved business where confidential matters (such as reviews of student progress) are under discussion. Participation need not involve attendance at every meeting. Written submissions and responses to papers should be welcomed.

ANNEXE 2: EXAM CONVENTIONS

Examination Conventions for students starting the Part-time MSc
Precision Cancer Medicine in Michaelmas Term 2020

Where the information given in these Examination Conventions differs from information in Examination Regulations of handbook, please treat these Conventions as the up-to-date source of information. Please contact msc_pcm@oncology.ox.ac.uk if you have any questions about teaching or assessment arrangements for your course.

Please note that it may be necessary to make changes to your course during the academic year, as a result of the Covid-19 pandemic. Should any such changes be required, all relevant students will be informed and a revised version of these Conventions will be published.

1. Introduction

Examination conventions are the formal record of the specific assessment standards for the course or courses to which they apply. They set out how examined work will be marked and how the resulting marks will be used to arrive at a final result and classification of an award.

Approval and Distribution of Examination Conventions

These examination conventions have been approved for use in this academic year by the Organising Committee for the MSc in Precision Medicine, and by the Medical Sciences Division Audit Sub- Committee, which has delegated authority from the Medical Sciences Board (the supervisory body according to the Examination Regulations and the Education Committee’s Examinations and Assessment Framework for examiners and others involved in University Examinations for this purpose (<https://academic.admin.ox.ac.uk/examiners>)).

These examination conventions were approved by the Organising Committee in October 2020.

These examination conventions were approved by the Audit Sub-Committee in October 2020.

These conventions are available on the [Course Canvas site](#).

The regulations for the MSc in Precision Cancer Medicine can be found here (add link once live)

2. Rubrics for individual papers

Students will study eight compulsory taught modules and in addition they will complete a research project of up to 20 weeks. The eight taught modules are as follows:

- 1. Introduction to Human Genetics and Genomics

- 2. Omics Techniques and their application to Genomic Medicine
- 3. Clinical Interpretation of Precision Diagnostics and Response Monitoring
- 4. Clinical Bio-informatics
- 5. Treatment, pharmacogenomics, clinical trials and experimental cancer therapeutics.
- 6. Ethics and Health Economics
- 7. Global Perspective on Molecular Pathology, Imaging and Early Detection.
- 8. Onco-Immunology and Genomics

Examination/Assessment Requirements & Marking Scales/Criteria

Assessment 1: Extended Essay (Year One)

1. Assessment Requirements:

Candidates will be examined in the following way:

- (i) An essay of a maximum of 2500 words selected from a choice of essay titles based on modules 1-4 of the Schedule.

A choice of essay titles will be provided to students by the beginning of Hilary Term in Year One.

The assessment must be submitted via an authorised online submission platform (details of which will be notified to students by the Course Administrator), by noon of Friday 11th June 2021.

2. Assessment Explanation / Description

The essay should be no more than 2,500 words, exclusive of figures and figure legends, tables, bibliography and any necessary appendices, and should include a word count on the title page. It should be a well-researched scholarly presentation on the subject area covered by the assignment title to which it relates. The essays should be the student’s own synthesis of the primary data: excessive dependence on secondary sources in essays will result in being marked down. If students are in doubt as to the essay style, format or content for any particular area, they are strongly advised to ask the course teaching fellow or an appropriate module leader(s) for advice.

3. Marking Scheme (numerical) and Marking Criteria (qualitative)

The pass mark for the Extended Essay is 50%.

An absolutely outstanding essay, showing comprehensive coverage, integration of material from a variety of sources and a sound critical assessment of this material. Demonstrates reading outside the lecture course and originality/novelty of thought.	100 - 90
A very good essay indeed. Shows wide coverage, integration of material from a variety of sources (including non-lecture material) and critical assessment of this material.	89 - 80
A very good essay, showing breadth of coverage (including some examples from outside the lecture course), well integrated material and some attempt at critical assessment.	79 - 70
A good essay, showing breadth of coverage (including some examples from outside the lecture course) and well integrated material, but little evidence of critical involvement with the material.	69 - 60

A satisfactory essay, basically well supported by materials from the lectures, but somewhat defective in organisation or breadth of coverage	59 - 50
An unsatisfactory essay, which includes the major points from the lectures, but little else.	49 - 40
A weak essay that omits several major points.	39 - 30
A very poor essay that omits considerable areas of the subject specified in the title.	29 - 20
An inadequate essay that contains only small amounts of relevant material.	19 - 10
An essay that contains no relevant material	9-0

Assessment 2: Problem-solving Assessment (Year One)

1. Assessment Requirements:

Candidates shall be examined in the following way:

A problem-solving assessment of a maximum of 2500 words selected from a choice of tasks based on modules 1-5 of the Schedule.

A choice of assessment tasks will be provided to students by the beginning of Hilary Term in Year One.

The assessment must be submitted via an authorised online submission platform (details of which will be notified to students by the Course Administrator), by noon of Friday 6th August 2021.

2. Assessment Explanation / Description

The submission should be no more than 2,500 words, exclusive of figures and figure legends, tables, bibliography and any necessary appendices, and should include a word count on the title page. The problem-solving assessment will test students' ability to apply the content of the MSc to day-to-day research, or clinical and other scientific work. If students are in doubt as to the style, format or content for any particular area, they are strongly advised to ask the Course Director or an appropriate module leader(s) for advice.

3. Marking Scheme (numerical and Marking Criteria (qualitative))

The pass mark for the problem-solving assessment is 50%.

An absolutely outstanding assessment, showing comprehensive coverage, integration of material from a variety of sources and a sound critical assessment of this material. Demonstrates reading outside the lecture course and originality/novelty of thought.	100 - 90
A very good assessment indeed. Shows wide coverage, integration of material from a variety of sources (including non-lecture material) and critical assessment of this material.	89 - 80
A very good assessment, showing breadth of coverage (including some examples from outside the lecture course), well integrated material and some attempt at critical assessment.	79 - 70
A good assessment, showing breadth of coverage (including some examples from outside the lecture course) and well integrated material, but little evidence of critical involvement with the material.	69 - 60
A satisfactory assessment, basically well supported by materials from the lectures, but somewhat defective in organisation or breadth of coverage	59 - 50
An unsatisfactory assessment, which includes the major points from the lectures, but little else.	49 - 40
A weak assessment that omits several major points.	39 - 30

A very poor assessment that omits considerable areas of the subject specified in the title.	29 - 20
An inadequate assessment that contains only small amounts of relevant material.	19 - 10
An assessment that contains no relevant material	9 - 0

Assessment 3: Written Examination (Year Two)

1. Assessment Requirements:

Candidates shall be examined in the following way:

A written examination paper relating to all the modules set out in the Schedule.

Each candidate must pass a final 3 hour written examination during the residential school at the end of Hilary term, Year Two. As the materials from modules 1-5 will be tested via the assessed coursework, the exam will focus mainly on material taught in the later modules (modules 6-8) but will also draw on some topics from the earlier modules.

2. Assessment Explanation/Description

The examination will last for 3 hours and will consist of short written essays. The rubric states: "Answer THREE questions, not more than TWO per section Please start the answer to each question on a separate sheet."

3. Marking Scheme (numerical) and Marking Criteria (qualitative)

The pass mark for the examination is 50%.

A mark of zero shall be awarded for any part or parts of questions that have not been answered by a candidate, but which should have been answered. The marking scheme follows the same qualitative criteria as the extended essay above.

Assessment 4: Dissertation (Year Two)

1. Assessment Requirements:

Candidates shall be examined in the following way:

A dissertation of not more than 10,000 words on the research project as set out in the Schedule. The research project and the subject of the dissertation must be approved by the Organising Committee.

Preparation for the dissertation will begin no later than Michaelmas term of year 2. Candidates will choose from a selection of available projects, but can also suggest their own. The research project and the subject of the dissertation must be approved by the Organising Committee. Candidates are required to undertake an original research project of approximately 20 weeks duration (part-time) or 12 weeks duration (full-time).

The dissertation must be submitted via an authorised online submission platform (details of which will be notified to students by the Course Administrator), by noon of Tuesday 16th August 2022.

2. Assessment Explanation / Description

Each candidate for the MSc in Precision Medicine is required to submit the assessment via a secure authorised online method, by dates to be specified by the Organising Committee and published in the course handbook no later than the start of Michaelmas Term of the first year of the course.

Each dissertation should be not more than 10,000 words in length, exclusive of figures and figure legends, tables, bibliography and any necessary appendices, and should include a word count on the title page.

Dissertations which exceed this length may be marked down as a consequence (as above). In principle, the dissertation should be prepared as a research thesis. There should be separate, headed sections for the abstract, introduction, methods, results, discussion and bibliography, and the pages of the dissertation should be numbered.

3. Marking Scheme (numerical) and Marking Criteria (qualitative)

70 -100% A dissertation graded above 70 is of Distinction standard and should be a study that has been carefully conducted and analyzed. It is not expected that the idea for the project should have been devised by the candidate, but there should be signs of originality, either in developing the project, or in analysing or interpreting it. The dissertation should be clearly presented and show a depth of understanding of the field. The introduction should present clearly the rationale for the scientific study and the discussion should provide a reasoned, integrative account of the scientific results.

60-69% A dissertation of this standard should also have been carefully conducted and analysed. However, there is less of a requirement for originality. The introduction and discussion should show a good understanding of the field and contain some evaluation of the experimental material, even if that evaluation is not original. There should be no major error in the conduct or analysis of the experimental data.

50-59% A dissertation of this standard should show good evidence of careful attempts to conduct and analyse the material. The write up may be inadequate in one of the following areas: an inadequate presentation of the purpose of the study, an inadequate description of the methods, inadequately labelled traces or diagrams, an inappropriate analysis, errors in the analysis, or a discussion that fails to interpret the results correctly. These problems will be taken as evidence of weakness in basic scientific skills, but they should not be so serious that they call into question the major conclusions from the experiment.

Below 50% A dissertation of below 50 will be of a relatively poor standard and may be inadequate in one or two of the following areas: an inadequate presentation of the purpose of the study, an inadequate description of the methods, inadequately labelled traces or diagrams, an inappropriate analysis, errors in the analysis, or a discussion that fails to interpret the results correctly. These problems are likely to be serious enough that they affect one of the major conclusions from the experiment. There will be evidence of carelessness in conducting the work and analysing the data. Work of this grade is not necessarily a failure, but is one which indicates that the Examiners will focus on these deficiencies during the viva exam. If a below 50 mark is not redeemed during the viva examination it will be marked as a fail and require re- writing and re-examination.

Unsuccessful Projects

No original research can have a guaranteed outcome. The Examiners are aware that the time available for dissertation research work is limited, and so any lack of ‘success’ in achieving the original aims of the project will not in itself be penalised. In particular, no

candidate should be blamed for unforeseen difficulties or for a supervisor’s over-ambitious plans.

If projects are limited or disappointing in what they achieve, it is important that they should be written up accurately without claiming more than is justified. Regardless of ‘success’ or ‘failure’ with experimental work, candidates should comment on the reasons for the difficulties encountered, and make sensible suggestions for appropriate further work.

Supervisors will be asked to report to the examiners on any particular difficulties associated with the project.

3. Marking Conventions

3.1 University scale for standardised expression of agreed final marks.

For students starting PGT courses from Michaelmas term 2020, agreed final marks for individual papers will be expressed using the following scale:

70 - 100	Distinction
65 – 69	Merit
50 – 64	Pass
0 – 49	Fail

3.2 Qualitative criteria for different types of assessment.

Refer to Section 2 for details of qualitative criteria.

3.3 Verification and reconciliation of marks

Marks are awarded by two independent markers. Where marks differ by less than 10% an average would be taken. Where marks differ by 10% or more, or where marks cross a grade boundary, they will not be averaged blindly. An agreement on a final mark will take place following discussion between the markers. If the two markers cannot agree then the Chair will make a final decision having taken specialist advice from a third marker, if necessary.

3.4 Scaling of marks

The Education Committee considers that it is appropriate to scale marks for a paper where it has been established that a paper was more difficult or easy than in previous years

Examiners need to establish if they have sufficient evidence for scaling. A significantly higher or lower median or mean mark for a paper relative to previous years would not itself constitute sufficient evidence for this. Further evidence should also be identified, for example, via:

- examiners’ academic evaluation of the performance of the candidates (possibly guided by qualitative descriptors of each level of achievement);
- a comparison with the questions set in previous years’ papers; and/or
- an analysis of the spread of candidates’ performance in compulsory papers compared to their performance in the paper in question.

Scaling should not be used mechanistically to fit the spread of results on a paper to historical norms.

- (i) Scaling should only be considered and undertaken after moderation of a paper has been completed.
- (ii) If it is decided that it is appropriate to use scaling, examiners should review a sample of papers either side of the degree category borderlines to ensure that the outcome of scaling is consistent with academic views of what constitutes a paper in each degree category.
- (iii) All scaling of marks must be done in the year in which the paper(s) in question is/are taken.
- (iv) Detailed information about why scaling was necessary and how it was applied should be included in the Examiners' Report.
- (v) All examiners and boards should seek expert advice on the construction and operation of algorithms, where appropriate.
- (vi) All algorithms used for the purposes of scaling must be transparent and justifiable, and must be published as appropriate for the information of all examiners and students.

Examiners should also satisfy themselves that, if a computer algorithm is used in the classification process, its rules are fully consistent with the current conventions, especially if changes are being made to the conventions.

Such scaling is used to ensure that candidates' marks are not advantaged or disadvantaged by the above situation.

3.5 Short-weight conventions and departure from rubric

A mark of zero shall be awarded for any part or parts of questions that have not been answered by a candidate, but which should have been answered.

3.6 Penalties for late or non-submission

The scale of penalties agreed by the Medical Sciences Division in relation to late submission of assessed items is set out below. Details of the circumstances in which such penalties might apply can be found in the Examination Regulations (Regulations for the Conduct of University Examinations, Part 14.)

1. If a candidate submits late, but on the prescribed date of submission, the examiners shall mark the submitted work and impose the following academic penalty:

5 points (marks) will be deducted from the candidate's final agreed mark for the assessment, on the University's 100-point marking scale.

The Proctors will also charge candidates a late submission fee (but this may be waived by them if it appears reasonable to do so).
2. If a candidate submits after the prescribed date of submission and without prior authorisation, the Proctors may give the examiners permission to apply the following academic penalties.

Such penalties will be applied regardless of whether or not the piece of work is submitted over a weekend, public holiday, or fixed closure day etc. after the

deadline:

- ≤ 24 hours late: 5 points (marks) will be deducted from the candidate's final agreed mark for the assessment, on the University's 100-point marking scale;
- > 24 hours and ≤ 48 hours late: 10 points (marks) will be deducted from the candidate's final agreed mark for the assessment, on the University's 100-point marking scale;
- > 48 hours and ≤ 72 hours late: 20 points (marks) will be deducted from the candidate's final agreed mark for the assessment, on the University's 100-point marking scale;
- > 72 hours late: the submission will automatically be deemed a non-submission and will result in failure of the assessment unit with any re-sit capped at the pass mark.

Candidates are advised to contact their course director for advice as soon as possible, in particular if there may be a valid reason for late submission¹.

The Proctors will also charge candidates a late submission fee (but this may be waived by them if it appears reasonable to do so).

3. When late submission (≤ 72 hours late) results in failure of an assessment unit following the application of an academic penalty, this will be treated as a fail as a result of poor academic performance, with re-sit arrangements as set out in Section 5 of the Examination Conventions.
4. Where a submission is deemed a non-submission (> 72 hours late), as set out in Section 5 of the Examination Conventions, the mark for the re-sit of the assessment unit will be capped at the pass mark.

3.7 Penalties for over-length work and departure from approved titles or subject-matter

[[Examination Regulations, Regulations for the Conduct of University Examinations, Part 16, Regulation 16.6, https://examregs.admin.ox.ac.uk/Regulation?code=rftcoue-p16markandasse&srchYear=2019&srchTerm=3&year=2019&term=1/](#)]

Where a candidate submits a dissertation (or other piece of written coursework) which exceeds the word limit prescribed by the relevant regulation, the examiners, if they agree to proceed with the examination of the work, may reduce the mark.

The Medical Sciences Board has agreed the following tariff of marks to be deducted for over-length work:

≤ 5% over word limit	5 marks will be deducted from the candidate's final agreed mark for the assessment, on the University's 100-point marking scale.
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¹A valid reason for late submission could include factors affecting performance, such as an acute illness or a bereavement.

>5% and ≤ 10% over word limit	10 marks will be deducted from the candidate’s final agreed mark for the assessment, on the University’s 100-point marking scale.
>10% and ≤ 20% over word limit	20 marks will be deducted from the candidate’s final agreed mark for the assessment, on the University’s 100-point marking scale.
> 20% over word limit	The candidate will be awarded zero marks (a fail) for the assessment concerned.

Where a penalty for over-length work results in failure of an assessment item, this will be treated as an academic fail of the assessment item. The policy on resits is set out in Section 5 of the Examination Conventions.

Please refer to section 2 for details of word count for individual assessments.

3.8 Penalties for poor academic practice in coursework

The University regards plagiarism in examinations as a serious matter. The University’s approach to the prevention and management of plagiarism is set out in the [Plagiarism Strategy](#).

Student specific information about plagiarism is available on the [Oxford Student Website](#).

Details of procedure for dealing with cases of poor academic practice and plagiarism in taught degree examinations are available in the [Examinations and assessment framework \(EAF\)](#).

If a marker, or a Turnitin report generated in the course of examination procedures, raises concerns about the proper attribution of a passage or piece of submitted work, the matter will be reported to the Chair of Examiners. The Chair will compile and retain any evidence and decide whether or not the case is one which may be dealt with by the Board (poor academic practice) or whether it is one that requires reference to the Proctors for investigation and possible disciplinary action (in the case of suspected Plagiarism).

Where the Chair finds that the matter can be dealt with by the Board, assessors will mark the work on its academic merits. Determined by the extent of poor academic practice, the board shall deduct between 1% and 10% of the marks available for cases of poor referencing where material is widely available factual information or a technical description that could not be paraphrased easily; where passage(s) draw on a variety of sources, either verbatim or derivative, in patchwork fashion (and examiners consider that this represents poor academic practice rather than an attempt to deceive); where some attempt has been made to provide references, however incomplete (e.g. footnotes but no quotation marks, Harvard-style references at the end of a paragraph, inclusion in bibliography); or where passage(s) are ‘grey literature’ i.e. a web source with no clear owner.

If a student has previously had marks deducted for poor academic practice or has been referred to the Proctors for suspected plagiarism the case must always be referred to the Proctors.

In addition, any more serious cases of poor academic practice than described above should also always be referred to the Proctors.

While it is not permissible to submit work which has been submitted, either partially or in full, either for your current Honour School or qualification, or for another Honour School or qualification of this University (except where the Special Regulations for the subject permit this), or for a qualification at any other institution, it is permissible to use formative work that has been written during the course of their studies (e.g. collections, tutorial essays).

3.9 Penalties for non-attendance

Failure to attend an examination will result in the failure of the assessment. The mark for any re-sit of the assessment will be capped at a pass.

4. Progression rules and classification conventions

4.1 Qualitative descriptors of Distinction, Merit, Pass, Fail

Final outcome rules:

For students starting PGT courses from Michaelmas term 2020, agreed final marks for individual papers will be expressed using the following scale:

Agreed final mark	Degree outcome	Degree descriptor
70-100	Distinction	Across all 4 summatively assessed components the candidate has shown clear signs of critical analysis, originality and an excellent understanding of the field of precision cancer medicine. Work will have been presented clearly in a scholarly fashion, with clear evidence of carefully evaluating data/information and no major errors. The work will also include a significant component of material beyond the scope of the lecture course.
65-69	Merit	The candidate has demonstrated a good understanding of the field of precision cancer medicine. Work will have been presented clearly, in a scholarly fashion with some evidence of careful evaluation of data/information and with no major errors. The work will also include some examples of material beyond the scope of the lecture course.
50-64	Pass	The candidate has demonstrated a reasonable understanding of the field of precision cancer medicine. Although the work should give good evidence of careful attempts to analyse data/information of conduct the project, the presented work may be inadequate in one of the following areas: presentation, content, inappropriate/errors in analysis or incorrect interpretation.
0-49	Fail	The candidate demonstrates a limited understanding of the field of precision cancer medicine. The submitted work will be inadequate in one or two of the following areas: inadequate/carelessness in the presentation, analysis of interpretation of data/information or conduct of the project. The work will also have significant deficiencies in content and/or contain major errors.

Details of the marking scheme for each of the summatively assessed components used to generate the final mark and associated classification is detailed above in section 2.

4.2 Classification rules

The Board of Examiners agrees and ratifies the final agreed marks. The Board will consider all borderline cases as detailed below.

- Candidates who receive an overall average mark of 70-100 will have successfully passed the degree examination and will be awarded an MSc in Precision Cancer Medicine with Distinction.
- Candidates who receive an overall average mark of 65-69 will have successfully passed the degree examination and will be awarded an MSc in Precision Cancer Medicine with Merit.
- Candidates who receive an overall average mark of 50-64 will have successfully passed the degree examination and will be awarded an MSc in Precision Cancer Medicine.
- Candidates who receive an overall mark of 0-49 will have failed the degree examination.

Candidates who have failed the requirement of the MSc but have satisfied the requirements for the award of the Postgraduate Diploma (all the requirements for the MSc, except completion of the dissertation) may be awarded the Postgraduate Diploma.

Candidates who have satisfied the requirements for the award of the Postgraduate Diploma (all the requirements for the MSc, except completion of the dissertation) and who do not wish to continue their studies, may end their registration and at that point be awarded the Postgraduate Diploma.

Examination & Assessment Outcomes

The table below shows how marks for each examination/assessment in this MSc course contribute to the final degree outcome.

Weighting (% contribution to Final Award)

There are 4 summatively assessed components that candidates must pass for the award of this MSc. These components are weighted as follows:

Assessment	Weighting (% contribution to Degree Outcome / Final Award)
Extended Essay	15%
Problem-solving Assessment	15%
Written Exam	30%
Dissertation	40%

Candidates must achieve a pass in all components in order to pass the examination overall.

Candidates who have initially failed any element of the examination will not be eligible for the award of a Distinction or Merit.

Aggregation of marks

Examiners are able to consider mitigating circumstances, i.e. medical and other circumstances (including disability) that may have affected a candidate’s performance in exam-

inations and assessments. Examiners may then adjust a candidate’s result if necessary.

Agreed marks for individual assessments are converted into a standardised expression of agreed final marks i.e. on a 100-point scale (if not on this scale already).

Final marks, as agreed by the examiners, for each assessment and for the degree as a whole, are represented as whole numbers on the University’s 100-point scale. Marks for individual assessments will be weighted according to how they contribute to the final degree outcome (see Examination & Assessment Outcomes above for weightings).

Moderation

All summatively assessed work is double-blind marked i.e. it is marked independently by two examiners or assessors (or an examiner and an assessor) who do not consult or see each other’s marks/comments.

Borderline Marks

For the overall degree, a candidate whose overall mark lies within ≤2.5 marks of a particular boundary (distinction/merit, merit/pass or pass/fail) will be considered as ‘borderline’. In such cases, the Board of Examiners will take some or all of the following factors into account in deciding the candidates’ agreed final mark for the degree:

- (i) the overall mean mark;
- (ii) the overall median mark;
- (iii) the distribution of assessment marks;
- (iv) the candidate’s performance in practical/laboratory or other (non-examined) course work;
- (v) any mitigating circumstances notices notified by the Proctors

4.3 Progression rules

Candidates are required to pass all elements of the course to be eligible for the award of the MSc. Candidates who do not pass an assessment at first attempt will be eligible to resit the assessment on the next opportunity, and this must be taken within the next two opportunities.

4.4 Use of vivas

Candidates may be called for a viva at the discretion of the examiners. Dates of the viva will be communicated to the candidates in a timely way.

5. Resits

Where a candidate has failed an assessment unit as a result of poor academic performance the mark for the resit of the assessment unit will be awarded on the merits of the work.

Where a candidate has failed an assessment unit as a result of non-submitting an assessment item or as a result of non-attendance at a timed examination the mark for the resit of the assessment unit will be capped at a pass (50%).

In this context, an ‘assessment unit’ can refer to a single timed examination, a submission,

other exercise, or a combination of assessment items. Where the assessment unit consists of more than one assessment item, for example a submission and a timed examination, if the candidate passes the submission but fails the timed examination, they are only required to resit the failed assessment item (in this example the timed examination) not all the assessment items for the assessment unit.

6. Consideration of mitigating circumstances

A candidate's final outcome will first be considered using the classification rules/final outcome rules as described above in section 4. The exam board will then consider any further information they have on individual circumstances.

Where a candidate or candidates have made a submission, under Part 13 of the Regulations for Conduct of University Examinations, that unforeseen circumstances may have had an impact on their performance in an examination, a subset of the board (the 'Mitigating Circumstances Panel') will meet to discuss the individual applications and band the seriousness of each application on a scale of 1-3 with 1 indicating minor impact, 2 indicating moderate impact, and 3 indicating very serious impact. The Panel will evaluate, on the basis of the information provided to it, the relevance of the circumstances to examinations and assessment, and the strength of the evidence provided in support. Examiners will also note whether all or a subset of papers were affected, being aware that it is possible for circumstances to have different levels of impact on different papers. The banding information will be used at the final board of examiners meeting to decide whether and how to adjust a candidate's results. Further information on the procedure is provided in the Policy and Guidance for examiners, Annex C and information for students is provided at www.ox.ac.uk/students/academic/exams/guidance.

Candidates who have indicated they wish to be considered for a Declared to have Deserved Masters (DDM) degree will first be considered for a classified degree, taking into account any individual mitigating circumstances as notified to the examiners. If that is not possible and they meet the DDM eligibility criteria, they will be awarded DDM.

7. Use of 'Turnitin'

The University reserves the right to use software applications to screen any individual's submitted work for matches either to published sources or to other submitted work.

8. The Role of the Proctors

Candidates' attention is drawn to the [role of the Proctors](#) in ensuring the proper conduct of examinations and in investigating complaints in relation to the assessment of student work.

The University places a high priority on the fair and consistent operation of assessment procedures, especially in relation to measures to prevent fraudulent activities, to the detection of any forms of academic misconduct relating to assessment such as plagiarism, collusion, cheating, impersonation and the use of inadmissible material; and to the imposition of appropriate consequences and penalties for the late or non-submission of material for assessment. All these matters will be referred to the Proctors.

9. Results

Candidates should refer to:

<http://www.ox.ac.uk/students/academic/exams/results>. Students can access their results information using Student Self Help, accessed via: <http://www.ox.ac.uk/students>. Once results have been released by the Examination Board students will automatically be sent an e-mail informing them that their results are available from their Student Self Service account. Students will be able to view their results via eVision.

10. Appeals

Please refer to the course handbook for information regarding appeals.

11. Feedback to Candidates

Feedback is provided on the formatively assessed work and on the dissertation.

12. Board of Examiners for the academic year 2020-21

Chair of Examiners: Professor James East, Associate Professor, Nuffield Department of Medicine

Internal Examiners:

Dr Derrick Bennet (Senior Statistician, Nuffield Department of Population Health)

Dr Apostolos Tsiachristas (Senior Researcher, Health Economics Research Centre, Nuffield Department of Population Health)

Dr Eileen Parkes (Clinical Career Development Fellow, Department of Oncology)

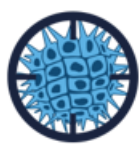
Dr Kate Ridout (High-Throughput Sequencing Bioinformatician, Department of Oncology)

External Examiners:

Professor Simon Morely (Professor of Signal Transduction (Biochemistry), University of Sussex)

Professor Jon Strefford (Professor of Molecular Oncology, Faculty of Medicine, University of Southampton)

Candidates should not under any circumstances seek to make contact with individual internal or external exam



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ONCOLOGY
Medical Sciences Division



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