**THE UNIVERSITY OF EDINBURGH**

Programme Specification for

**MSc/Diploma/Certificate in Next Generation Drug Discovery**
**(Distance Learning)**

1) **Awarding Institution:** University of Edinburgh

2) **Teaching Institution:** School of Biological Sciences

3) **Programme accredited by:** N/A

4) **Final Award:** MSc/Diploma/Certificate

**Programme Title:** MSc/Diploma/Certificate in Next Generation Drug Discovery

5) **UCAS Code:** N/A

6) **Relevant QAA Subject Benchmarking Group(s):**

7) **Postholder with overall responsibility for QA:** Dr M Gallagher

8) **Date of production/revision:** November 2012

9) **External Summary**

This programme is about the skills, knowledge and thinking behind modern, and future, drug discovery, both of small ligands and of protein-based drugs (biologics). It is designed to give students a sophisticated and broad-based education in the subject.

The School of Biological Sciences in the University of Edinburgh offers a fertile research environment that underpins these aims: there are strong research programmes in Drug Discovery and in Systems Biology. The School also has a research concentration in trypanosomal diseases. The University has a tradition for producing high quality distance learning courses, which is supported by a robust infrastructure. Our teaching is innovative and engaging.

Students will enhance their career prospects by acquiring current, marketable knowledge and developing advanced analytical and presentational skills, within the social and intellectual sphere of a leading European university. The School of Biological Sciences offers a research rich environment in which to develop as scientists and entrepreneurs.

During the Diploma or MSc programme students can expect to achieve the following:

- Appreciation of the challenges in the development of novel drugs, both small molecule and biologics.
- Strong background in the science underlying emerging fields of Drug Discovery
- Ability to apply new ideas into conventional Drug Discovery with the skills to analyse problems in scientific and practical terms
- Understanding of how Drug Discovery relates to real-world health problems
• Appreciate the commercial aspects of the subject
• Ability to think about the future development of Drug Discovery.

The programme is similar to the 3yr Masters in Next Generation Drug Discovery. This version offers more flexibility to those who would be attracted only if they could complete more quickly than three years. Some prospective students on career breaks, for example, might have the time to commit to this programme. Below it is explained that more compulsory courses need to be passed in the 1\textsuperscript{st} year to qualify for the 2 yr programme, which should select for students who are able to complete it.

10) Educational Aims of Programme:

The MSc aims to give students a thorough grounding in Next Generation Drug Discovery, and produce a trained intellect that is capable of critical thinking.

The programme aims to develop skills in:
• Knowledge and understanding
• Research skills in both authentic Drug Discovery problems and library
• Awareness of unresolved issues and unanswered questions in the area of Drug Discovery
• Graduate attributes: a range of generic transferable skills

The programme aims to teach experimental methods used in Drug Discovery how to analyze and document experimental investigations; how to draw quantitative conclusions from experimental data and how to present results and theoretical knowledge. Specific courses develop particular skills. All students will develop the level of understanding that will allow engagement in debates on current topics in a broader context.

11) Programme Outcomes:

11a) Knowledge and Understanding

• Strong background in the science underlying emerging fields of Drug Discovery
• Ability to think about the future development of Drug Discovery
• Understanding of how Drug Discovery can be applied to ameliorate or solve, pressing real-world problems and create new growth industries

11b) Graduate attributes: Skills and Abilities in Research and Enquiry

Through a combination of solving realistic problems, research projects and group work, students learn current skills and approaches in biological research. An understanding of scientific method, allied to the ability to construct alternative arguments and hypotheses leads our students to develop an ability to evaluate evidence for and against particular points of view. Our students will have developed numerical competence. They will learn to report research data and conclusions through written reports and competent oral presentations.

Through participation in a combination of different teaching and practical experiences, graduates acquire the ability to:

• Develop critical thinking
• Discuss and evaluate scientific arguments
• Exchange ideas with scientific colleagues
• Communicate concepts and ideas to the wider public
• Formulate scientific questions and programmes of research
• Ability to design, interpret and critique experiments

11c) Graduate Attributes: Skills and abilities in Personal and Intellectual Autonomy

The development of critical thinking lies at the core of the intellectual training provided in the Next Generation Drug Discovery MSc programme. Students develop an increasing competence to deal with intellectual concepts and scientific discussion, and to evaluate contradictory arguments through both essay writing and research.

Students acquire the ability to:
• Organise complex arguments and draw these together into a coherent conclusion
• Understanding the relative value of different scientific approaches
• Summarise and interpret the work of others in the context of previous work and likely developments.
• Evaluate the strength and weaknesses of scientific evidence, thereby being able to arrive at independent conclusions
• Analyse graphs figures and tables
• Practise and record accurate observation
• Deliver presentations in a logical and coherent manner
• Acquire knowledge of opportunities and career pathways for professional development
• Learn analytical methods and apply them to problem solving
• Consider and understand scientific theories
• Formulate, investigate and discuss questions
• Engage and draw on an understanding of scientific investigations
• Build on existing knowledge to suggest new directions for investigation
• Understand the relevance and importance of explaining scientific ideas and the impact of science to the wider community.

11d) Graduate Attributes: Skills and Abilities in Communication

The development of communication skills occurs at all stages of the MSc programme. Skills comprise of:

• Oral and written communication (project, poster and paper presentations)
• Computer skills
• Graphical and numerical skills
• Library skills
• Problem solving skills
• Group and teamwork skills (working effectively)
• Analytical skills
• Independent learning
• Time management
• Organisational skills
• Numeracy and statistical analysis skills
• Problem solving
• Online/Internet information retrieval skills
11e) Graduate Attributes: Skills and Abilities in Personal Effectiveness

Student personal development is achieved through a number of interconnected learning processes and interaction with other students and staff. These processes include:

- Group working using a range of techniques (e.g. leadership; interaction with other students, supervisors, research fellows)
- Building confidence from completion of assignments, and via projects, presentations and essays.
- Collaborate efficiently and productively with others in the process of learning and presenting conclusions
- Organise their own learning, manage workload and work to a timetable
- Effectively plan, and possess the confidence to undertake and to present scholarly work that demonstrates an understanding of the aims, methods and considerations, and ability to form their own conclusions
- Work independently on the creation of essays and reports.
- Learning study techniques such as literature reading.
- Learning to analyse individual strengths and weaknesses through provided written and oral feedback.

11f) Technical/Practical Skills

Practical skills, which are all computer based, are acquired mainly through problem solving exercises and the research project. Quantitative and statistical skills are included within all course options.

- Ability to model the effect of drugs on biological systems.
- Ability to design experiments and contribute to development of tools used in Drug Discovery
- Enhanced scientific communication skills
- Ability to analyse the scientific understanding of pharmaceutical business development
- Acquire skills working in on-line environments
- Learn to work in an international, on-line community

12 Programme Structure and Features

Entry Requirements:
Students should possess a UK University undergraduate degree or its equivalent outside the UK (usually at least a 2:1 honours degree or its equivalent). Candidates are expected to possess a strong background in one or more of the following areas: biotechnology, biochemistry, chemistry, medicine, molecular biology, pharmacology and the related sciences. Physics, mathematics, or other backgrounds will also be considered on a case-by-case basis.

Language Requirements
The minimum requirements for non-native speakers of English are:
IELTS Academic module 6.5 (with score no lower than 6.0 in each section)
TOEFL-iBT 92 (with no score lower than 20 in each section)
Pearson Test of English: 61 (with no score lower than 56 in each section)
Cambridge CPE Grade C (ONLY for applicants who do NOT need Tier 4 visas to enter UK)
Cambridge CAE Grade B (ONLY for applicants who do NOT need Tier 4 visas to enter UK)
Modes of Study:
The programme is part time, running from mid September to the end of May in year 1. In year two there is an increased commitment in year 2, until to the end of August.

Progression and Exit Awards:
A certificate will be awarded on completion of 60 credit points. On completion of the taught component of the programme (120 credit points, achieved at the end of semester 2, year 2) a University Diploma may be issued to those who either wish to stop at that stage, or have not achieved a sufficiently high standard to be allowed to proceed to an MSc. Those students who progress will undertake a 60 credit research project and will be awarded the MSc upon completion (thus achieving the full 180 credit points).

Students who gain $\geq 50\%$ overall and $\geq 50\%$ in at least 80 of the 120 credits in the final overall assessment of the taught stage at the end of the second semester of year 2 can proceed to the dissertation stage, and carry out a full-time research project from April – August.

Students who gain $\geq 40\%$ overall and $\geq 40\%$ in at least 80 of the 120 credits in the final overall assessment who do not qualify to proceed will be awarded the Diploma and leave at the end of the second semester of year 2. Note than once a 10 credit course is marked Pass or Fail, a pass in this course counts as 10 credits $\geq 50\%$.

To be awarded the MSc, students must successfully complete both the taught and dissertation stages. Students may elect to exit at the end of the taught stage with the award of Diploma. Both the MSc and the Diploma may be awarded with Distinction.

Curriculum:
The taught component of the programme will comprise 120 credit points made up of recommended core courses and elective (optional) courses. In addition, there will be a dissertation project in part of the second semester in years 2, then full-time from April- end of August, valued at 60 credits.

Core courses will be 10 points and will be split between the first and second semesters.

A full breakdown of the course options available with credit points and levels is given below:

**YEAR 1**

<table>
<thead>
<tr>
<th>Course</th>
<th>Course Name</th>
<th>Period</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGBI11074</td>
<td>Professional Skills in Drug Discovery</td>
<td>Semester 1</td>
<td>10</td>
</tr>
<tr>
<td>PGBI11072</td>
<td>Introduction to Modelling Biological Systems</td>
<td>Semester 1</td>
<td>10</td>
</tr>
<tr>
<td>PGBI11071</td>
<td>Measuring Drug Binding</td>
<td>Semester 1</td>
<td>10</td>
</tr>
<tr>
<td>PGBI11070</td>
<td>Structure Determination of Drug Targets</td>
<td>Semester 2</td>
<td>10</td>
</tr>
<tr>
<td>PGBI11069</td>
<td>Computing Skills for Drug Discovery</td>
<td>Semester 2</td>
<td>10</td>
</tr>
<tr>
<td>PGBI11067</td>
<td>Druggable Systems</td>
<td>Semester 2</td>
<td>10</td>
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</tbody>
</table>

**YEAR 2**

<table>
<thead>
<tr>
<th>Course</th>
<th>Course Name</th>
<th>Period</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGBI11081</td>
<td>Systems Approach to Modelling CST</td>
<td>Semester 1</td>
<td>10</td>
</tr>
<tr>
<td>PGBI11080</td>
<td>Modelling Metabolic Pathways</td>
<td>Semester 1</td>
<td>10</td>
</tr>
<tr>
<td>PGBI11079</td>
<td>In Silico Drug Discovery</td>
<td>Semester 1</td>
<td>10</td>
</tr>
<tr>
<td>PGBI11078</td>
<td>Molecular Modelling</td>
<td>Semester 1</td>
<td>10</td>
</tr>
<tr>
<td>PGBI11077</td>
<td>High Throughput Drug Discovery</td>
<td>Semester 2</td>
<td>10</td>
</tr>
</tbody>
</table>
Note that all courses in the first year are compulsory, compared to 4 only on the cognate 3 year programme. The higher bar of having to pass all courses in 1st year should select for students who have a good chance to complete the whole Masters course in two years. Note also that taking 40 points in Semester 1 is where the 2 year and 3 year courses diverge. The flexibility should be offered that a student may elect, due to circumstances, to revert to the 3 year programme as long as no more than two weeks since the beginning of a course has passed. A precedent at undergraduate level would be student offered direct entry being allowed to decline it after experiencing the work level for no more than two weeks. The total fees for a 2yr and 3yr masters will be the same.

Assessment:
The assessment methods are aligned to fostering a high degree of interaction through the web. Therefore much of the assessment will be by group assignments. Courses will be assessed by a group component, the mark for which will vary by assessment of each student’s contributions. This will be judged by a learner log as part of an e-portfolio. The portfolio will overarching across courses and contain a set of high level competencies and skills, for which students need to supply evidence for having attained through attaching examples of their work. The portfolio will build into a useful resource for students in their preparation in the job market and will also demonstrate engagement with assessment tasks, which will be part of the final mark for each course. Since the competencies and skills are generic, and are assessed on a course by course basis, there are no dependencies on previous paths through the programme.

13 Further Information on Learning and Teaching Methods and Strategies

Teaching and Learning strategies employed at the University of Edinburgh consist of a variety of different methods appropriate to the programme aims. The graduate attributes listed above are met through a teaching and learning framework (detailed below) which is appropriate to the level and content of the programme.

Teaching and Learning Activities include:

Use to electronic portfolio linked to a profile of graduate attributes.
Keeping of a learning diary.
Use of discussion groups.
Use of electronic forms to set goals at the start of each course, revisited at the middle, and a final reflection after formative feedback.
Problem based learning – based as much as is practicable on using tools used by professionals in the field.
A research project using on-line research data and analysis.
Wide use of Learning Objects with embedded MCQs to test the need to proceed and if so self-assessment of learning outcomes.

14 Further Information on Assessment Methods and Strategies

Courses are assessed by a diverse range of methods and it often takes the form of formative work which provides the student with on-going feedback as well as summative assessment which is submitted for credit.
Students are provided with written / and or oral feedback (digitally recorded) on all summative assessments.
Students are provided with feedback on their evidence for progression.
Opportunities are created for peer feedback in a formative sense to feed forward to future summative assessment.
Feedback is given in self-test MCQs to correct misconceptions and to direct students to further resources.

15 Further Information on Career Opportunities

Next Generation Drug Discovery graduates have a wide range of career options. The course will run for the first time so there are no data on who will recruit the students.

We expect that Next Generation Drug Discovery graduate employers can range from large pharmaceutical, to smaller biotech’ companies and Contract Research Organisations. Additionally, the skills acquired in working on-line with people from a wide variety of countries would fit our graduates to fill liaison positions; there will be opportunities to fill such a role between large pharmaceutical companies and the smaller organisations based increasingly in Asian and South American to whom the larger seem to be devolving much of their fundamental research.

Equally this qualification is great preparation for further research at PhD level and we hope and expect that this will be the case.

16 Other Items

The MSc in Next Generation Drug Discovery is one of seven programmes offered by the School of Biological Sciences at the University of Edinburgh.

The Programme Director of the MSc in Next Generation Drug is responsible for academic and pastoral guidance for students on the course. A position is funded for a Course Administrator with academic expertise in the subject who will adopt the role of Personal Tutor to each student on the programme, providing them with academic and pastoral support. Throughout a student’s time at the university the Tutor guides the student in choice of courses and provides general support.

Courses are administered and run through Teaching Organisations. These produce detailed course guides for new students. These guides provide details of courses and also advise students on assessment and general university policy and regulations.

The Degree Programme Tables (DPT) for the MSc Next Generation Drug Discovery (2yr) programme can be found at: http://www.drps.ed.ac.uk/index.php