

MRes Systems and Synthetic Biology

This document provides a definitive record of the main features of the programme and the learning outcomes that a typical student may reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities provided. This programme specification is intended as a reference point for prospective students, current students, external examiners and academic and support staff involved in delivering the programme and enabling student development and achievement.

Programme Information

Programme Title	Systems and Synthetic Biology			
Award(s)	MRes			
Programme Code	C1U1			
Associateship	None			
Awarding Institution	Imperial College London			
Teaching Institution	Imperial College London			
Faculty	Faculty of Natural Sciences			
Department	Department of Life Sciences			
Main Location of Study	South Kensington Campus			
Mode and Period of Study	1 academic year, full-time			
Cohort Entry Points	Annually in October			
Relevant QAA Benchmark Statement(s) and/or other external reference points	Master's Degree Characteristics			
Total Credits	ECTS:	90	CATS:	180
FHEQ Level	Level 7			
EHEA Level	2 nd cycle			
External Accreditor(s)	None			
Specification Details				
Student cohorts covered by specification	2021-22 entry			
Person responsible for the specification	Dr James W. Murray			
Date of introduction of programme	October 2008			
Date of programme specification/revision	August 2021			

Programme Overview

The course is provided in association with the Imperial College Centre for Synthetic Biology.

The course provides graduate students from life sciences, engineering and physical sciences with a platform to overcome traditional barriers to work collaboratively on the 'big problems' and applications in synthetic and systems biology. Students gain intensive hands-on experience in a combination of experimental biology and modelling in order to understand, predict and redesign biological pathways. There is a link with the BIOS Centre at King's College to facilitate the integration of this research with emerging ethical, legal and societal issues.

The taught elements of the course include introductory modules that cover essentials for both life and physical scientists, as well as modules on experimental systems biology, theoretical systems biology, synthetic biology, and advanced technologies. In addition to conventional lectures, the course requires active engagement by students through practicals, case studies, proposal writing, journal clubs, and an eight-month interdisciplinary research project. Only these activities will be marked; there will not be any formal written exams.

Learning Outcomes

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial College degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/students/academic-support/graduate-attributes

1. Knowledge and Understanding of:

- Core and specialised concepts in theoretical and experimental systems and synthetic biology – molecular biology and functional genetics, biophysics, biological networks, advanced technology, data analysis, and bioengineering.
- Research techniques, including information retrieval, experimental design and statistics, computer modelling, sampling, experimental techniques, engineering design, molecular characterisation, problem solving, and laboratory safety;
- Detailed knowledge and understanding of the essential facts, concepts, principles and theories relevant to the student's project;
- Management and communication skills, including problem definition, project design, decision processes, teamwork, written and oral reports, scientific proposals and publications.

2. Skills and other Attributes

Intellectual Skills:

- Analyse and solve problems in systems and synthetic biology using an integrated multidisciplinary approach;
- Integrate and evaluate information;
- Formulate and test hypotheses using appropriate design of models or experiments, as well as statistical analysis of data;
- Plan, conduct and write-up a programme of original research.

Practical Skills:

- Plan and execute safely a series of experiments or computations;
- Use laboratory methods or computer-based tools to generate data;
- Analyse results, determine their strength and validity, and make recommendations;
- Prepare technical reports;
- Give technical presentations;
- Use the scientific literature effectively.

Transferable Skills:

- Communicate effectively across different scientific disciplines through oral presentations, computer processing and presentations, and written reports;
- Apply knowledge, experimental, and modelling skills;
- Management skills: decision processes, objective criteria, problem definition, project design and evaluation needs;
- Integrate and evaluate information from a variety of sources;
- Transfer techniques and solutions from one discipline to another;
- Use Information and Communications Technology;
- Manage resources and time;
- Learn independently with open-mindedness and critical enquiry;
- Learn effectively for the purpose of continuing professional development.

Entry Requirements

Academic Requirement	Normally a 2.1 UK Bachelor’s Degree with Honours in a Physical, Engineering, Mathematical, or Life/Biomedical sciences-based subject (or a comparable qualification recognised by the College). A-level mathematics or equivalent is also normally required.
Non-academic Requirements	None
English Language Requirement	Standard requirement IELTS score of 6.5 overall (minimum 6.0 in all elements)

The programme’s competency standards document can be found at: <http://www.imperial.ac.uk/media/imperial-college/faculty-of-natural-sciences/department-of-life-sciences/public/postgraduate/masters/Life-Sciences-Competence-standards-PG.pdf>

Learning & Teaching Strategy	
Scheduled Learning & Teaching Methods	<ul style="list-style-type: none"> • Laboratory • Lectures • Tutorials • Seminars • Practical classes • Workshops • Group work exercises • Formal presentations
E-learning & Blended Learning Methods	<ul style="list-style-type: none"> • Online lecture materials • Computer-based work • Online lecture recordings
Project and Placement Learning Methods	<ul style="list-style-type: none"> • Individual research project & dissertation (9 months), which could include a placement
Assessment Strategy	
Assessment Methods	<ul style="list-style-type: none"> • Coursework • Essays • Dissertation • Presentations • Individual research project report • Viva
Academic Feedback Policy	
<p>Coursework is double-marked and comments by the markers annotated directly on the papers (electronically for submissions on blackboard). A summary of the feedback (with tick boxes indicating relative attainment on key dimensions) will be completed, and an indicative grade will be given (actual marks will not be communicated to the students). These papers will then be returned to the students as soon as possible and within two weeks of submission.</p> <p>Staff-student meetings are held termly to communicate general feedback between student representatives and the course directors. Additional meetings are held to provide general feedback and guidance e.g. on mock grant proposal and project selection.</p> <p>Dissertations are usually marked by the primary supervisor and secondary supervisor and an independent assessor, who provide feedback electronically that is returned to students after the final examiners meeting.</p>	
Re-sit Policy	
<p>The College's Policy on Re-sits is available at: http://www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/</p>	
Mitigating Circumstances Policy	

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Programme Structure

Full-time	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules	0	5	0	0	0
Elective Modules	0	0	0	0	0
Projects	0	0	1	1	0

Assessment Dates & Deadlines

Written Examinations	None
Coursework Assessments	Autumn Term
Project Deadlines	Summer
Practical Assessments	Autumn Term

Assessment Structure

Marking Scheme

Pass:

- Minimum standards (i.e. 50%) in each of the two assessed elements (assessed coursework and research project) will be required with an overall pass mark of 50% in order to be awarded a degree.

Merit:

- To achieve pass with merit a minimum of 60%, is required in each of the two assessed elements (assessed coursework and research project).

Distinction:

- To achieve pass with distinction a minimum of 70% is required in each of the two assessed elements (assessed coursework and research project).

Module Weightings

Element (% Weighting)	Module	% Module Weighting
Taught (40%)	Essentials for Life Scientists (Ia)	6.25%
	Essentials for Physical Scientists (Ib)	6.25%

	Experimental Systems Biology (II)	12.5%
	Theoretical Systems Biology (III)	12.5%
	Synthetic Biology (IV)	12.5%
	Advanced Technology (V)	12.5%
	Research Proposal	37.5%
Research (60%)	Research Project	100%

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
	Essentials for Life Scientists (Ia)	Core	13	43.25	0	56.25	0%	100%	0%	7	2.25
	Essentials for Physical Scientists (Ib)	Core	13	43.25	0	56.25	0%	0%	100%	7	2.25
	Experimental Systems Biology (II)	Core	12	100.5	0	112.5	0%	100%	0%	7	4.5
	Theoretical Systems Biology (III)	Core	14	98.5	0	112.5	0%	100%	0%	7	4.5
	Synthetic Biology (IV)	Core	22	90.5	0	112.5	0%	100%	0%	7	4.5
	Advanced Technology (V)	Core	10	102.5	0	112.5	0%	100%	0%	7	4.5
	Research Proposal	Core	1	236.5	0	237.5	0%	100%	0%	7	9.5
	Research Project	Core	0	1450	0	1450	0%	100%	0%	7	58

Supporting Information

The Programme Handbook is available at: <http://www.imperial.ac.uk/life-sciences/postgraduate/masters-courses/mres-in-systems-and-synthetic-biology/>

The Module Handbook is available at: <http://www.imperial.ac.uk/life-sciences/postgraduate/masters-courses/mres-in-systems-and-synthetic-biology/>

The College's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements

The College's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance

The College's Academic and Examination Regulations can be found at: <https://www.imperial.ac.uk/about/governance/academic-governance/regulations>

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<http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/charter-and-statutes/>

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