PROGRAMME SPECIFICATION

1	**Teaching Institution(s)**	University of Newcastle upon Tyne

2	**Programme Title:**	MSc Biomedical Nanotechnology

3 Programme Aims:

To produce graduates with the understanding, knowledge and skills base to enable them to pursue research careers in industry, the public sector or academia and to move easily between, and interact successfully with, each of these sectors. Specific aims:

- To convey to students the principles which underpin micro-, nano-, and biotechnology and how they are applied to the design and fabrication of biomedical devices.
- To provide students with individual experience of cutting-edge research at the interface between the life sciences, physical sciences and engineering within a multidisciplinary team environment.
- To introduce students to the need for skills necessary to successfully manage multidisciplinary research programmes and exploit and disseminate the results of those programmes within academic, industrial and entrepreneurial environments.
- To provide students with an understanding of the biotechnology, health and underpinning technologies sectors and of the structure of the organisations they will work for and interact with throughout their careers.
- To enhance the transferable and personal skills of individuals, and provide them with a basic knowledge of the tools which will help them operate most effectively within and communicate efficiently with the wide variety of public and commercial organisations in the sector.

4 Learning Outcomes:

A Subject Knowledge and understanding

Advanced knowledge and understanding of Micro and Nanotechnology and its existing and potential biomedical applications:

A1 Micro and nanoscale fabrication and manipulation
A2 Top-down and bottom up fabrication
A3 Self-assembly
A4 Biomolecular engineering
A5 Nanomaterials for implant technology and drug delivery
A6 Sensor systems

B Research techniques

A detailed understanding of and ability to apply relevant biomedical, biomolecular and micro/nano fabrication techniques for research and advanced academic study.

C Team-based Experimental Research Project

The completion of a team-based experimental research project. Specific learning outcomes are:

C1 To acquire an understanding of the essential elements of the project and an appreciation of the interdependence of the components which would normally be Faculty-specific.
C2 To practice interdisciplinary communication.
C3 To introduce students to project planning, management, self-evaluation and team working skills.
C4 An understanding of research methodology and experimental design, the formulation of hypotheses, the setting of priorities, effective planning, competence in a range of experimental techniques and an ability to assess the reliability and limitations of experimental data.
C5 An ability to record and analyse results and to assess their significance and value in both an academic and commercial environment.
C6 An understanding of the public and commercial sector with which they will interact in their careers.

D Professional and key skills

The acquisition of a range of professional and key skills including:

D1 An ability to effectively communicate research results verbally and in writing.
D2 Library and information technology skills.
D3 Business administration relevant to the biotechnology/pharmaceutical industries.

5 Learning Outcomes, Teaching and Learning Strategies and Methods

A Subject knowledge and understanding

The learning outcome is to provide students with core knowledge across the three disciplines of medicine, engineering and science and through the integration of these a comprehensive picture of the state-of-the-art at the cutting edge. This will be achieved through a closely connected series of lectures and laboratory exercises together with attendance at research seminars selected from those scheduled throughout the year by INSAT, the Network on Biomedical Applications of Micro & Nano Technologies, and the three aforementioned Faculties. As students on this multi-disciplinary course are expected to have different specialist backgrounds, these will in many cases be augmented by individually tailored programmes of private study (which may include attendance at additional lectures in areas complementary to their first degree specialisation, reading, laboratory and project work) matched to the carefully assessed needs and background of each student. Preparatory reading before commencement of the course will be strongly encouraged, and in some cases be mandatory.

B Research techniques

Research techniques are formally taught in lectures, supported by demonstrations and practicals to test acquisition of techniques and procedures.

C Team-based Experimental Research Project

Students undertake an experimental research project derived from the key research and development needs of larger multi-disciplinary projects assembled by INSAT and the main mode of learning is through teamwork. Students will analyse the multi-disciplinary project for its research and development needs, match these with their own interests and skills, assemble themselves into appropriate research teams, identify potential weaknesses in the team, and devise strategies to minimise their impact. Team members will identify and address individual research projects. Regular formal meetings will be held to ensure information exchange and allow teams to assess progress against agreed milestones and identify areas requiring additional resource allocation. Students will write reports on their own projects in the format of a research paper in the style of an approved journal and then assemble these into a coherent team project report. Presentation skills will be obtained by giving both oral and poster presentations.

D Professional and key skills

The rationale is to provide opportunities for 'hands-on' development of the skills within an explicit conceptual framework, underpinned by formative feedback. This element of the programme is intended to enable individual students to select and tailor learning experiences in accordance with their own professional/personal needs and may therefore vary from student to student. Teaching/learning methods include: workshops; formal training sessions; videoed exercises; group work; simulations; presentations; practical exercises; interactive seminars/tutorials and role-play.

6 Learning Outcomes and Assessment Strategies and Methods

A Subject knowledge and understanding

Knowledge and understanding are assessed in the written exam. Intellectual skills are assessed in the written exam and also by coursework. Practical and transferable skills are assessed by formative feedback.

B Research techniques

The main strategy is to test acquisition of the necessary practical techniques/skills and conceptual understanding that underpins effective project design etc. This is achieved through two assignments.

C Team-based Research Project

The following will be assessed: individual research project report, the team report, and individual and team oral and poster presentations at a special conference which will conclude the course.

D Professional and key skills

The assessment strategy is to provide formative feedback to the student as the skills develop rather than summative assessments.

7 Framework

The MSc in Biomedical Nanotechnology will produce graduates with the understanding, knowledge and skills base to enable them to pursue research careers in industry, the public sector or academia and to move easily between, and interact successfully with, each of these sectors. An objective of the course is to promote understanding, communication and career mobility across the academic-industry "divide" and, to help achieve this, all modules are compulsory. A seamless approach to delivery has been adopted to promote communication and mobility between "traditional" academic disciplines.

The programme is a 12 month full-time course comprising 180 credits, 20% generic research and transferable skills, 20% advanced subject knowledge and 60% research project. The 20% generic research and transferable skills comprises 15 credits from Research Techniques and 20 credits from Professional/Key Skills. Advanced Knowledge is worth 35 credits. The research project is worth 110 credits.

Component	*Title*	*Credits*
Subject Knowledge	Micro and nanoscale fabrication and manipulation	10
	Top-down and bottom up fabrication	5
	Self-assembly	5
	Biomolecular engineering	5
	Nanomaterials for Implant Technology and Drug Delivery	5
	Sensor systems	5
Research Techniques	Biomolecular Sciences	15
Research Project	Project	110
Professional/Key Skills	Library and Information Technology Skills	5
	Presentation Skills	5
	Communication of data (poster and oral presentations, scientific writing, powerpoint)	5
	Business for Biotechnologists	5
Total credits		**180**

8 Learning Outcomes and Curricular

A Subject Knowledge and Understanding

Advanced subject knowledge and understanding are gained in compulsory modules on subjects listed in 4A.

B Research Techniques

Relevant biomedical and biomolecular experimental techniques are taught in the compulsory Biomolecular Sciences Modules.

C Team-based Research Project

The learning outcomes listed in 4C are achieved through undertaking a research project.

D Professional and key Skills

Basic skills in how to communicate data and give an oral presentation are taught in one compulsory module and then at a more advanced level in a second compulsory module, together with scientific writing, poster presentations and PowerPoint. Basic Library and Information Technology Skills are taught in a compulsory module. Key skills in business administration relevant in the biotechnology and pharmaceutical industries are taught in a compulsory module.

9 Support for Students and their Learning

All students are registered in the Faculty of Medical Sciences Graduate School which has excellent infrastructure to support postgraduate students and their learning.

A Induction Programmes for New Research Students

The Graduate School organises an induction event for all new RESEARCH students which includes introductions to key figures and services in the Faculty and University, such as the Careers Service. This is followed by a reception which provides an early opportunity for students to interact socially. Candidates are provided with a Degree Programme Handbook detailing curricular assessment methods, degree regulations, and sources of help and support. All students receive information about the university organised first year conference which includes special welcome events for international students.

B Study Skills Support

Training in professional and key skills are an integral part of the programme. Students with weaker profiles in English language are also directed to attend in-sessional English classes at the Language Centre.

C English Language Support

For students whose native language is not English, there is a specifically designed English language course for scientists.

D Academic Support

Candidates benefit from a strong team of academic support. The three course co-ordinators act as personal tutors for all students in the first quarter, and assist each to identify an appropriate programme of private study which broadens the knowledge base they have acquired in their first degree. Early in the second quarter each student will be allocated a research project supervisor, who will be affiliated with the research group providing the primary expertise or facilities which underpin the students individual research project. A second supervisor will also be appointed to co-ordinate the research project team to which the student is affiliated. Students whose individual research project involves considerable interaction with an industrial partner or other beneficiary will normally be assigned a third supervisor from that sector.

E Pastoral Support

The aforementioned personal tutors will also provide pastoral support and this role will be taken over by the research project supervisors in the second quarter when they will provide guidance and support to assist students to explore career options which reflect their strengths, interests and skills. Students will be entitled to the full range of pastoral and personal support offered to postgraduate students which includes the University's Student Counselling Service, the Student Advice Centre and the Graduate School Office in the Faculty of Medicine. At a Faculty level, pastoral support is provided by the Faculty Postgraduate Tutor, Faculty Graduate School Administrative Assistant and Degree Programme Director. Administrative and welfare support is provided by the Faculty Graduate School Office.

F Support for Special Needs

The University has a Disability Unit to which the attention of all students is drawn. The University is also developing its service to mature students and to students who have childcare responsibilities. Hardship funds are available for both UK and international students.

G Learning resources

The University Library provides an excellent centrally-funded service for supporting student learning. It was the first university library to receive a Charter Mark for Excellence (1995, reviewed 1998). This is complemented in the Faculty by the Walton Library which holds 80,000 volumes, including around 900 current journal titles, and also provides work space and photocopying facilities.

The University Computing Service provides comprehensive computing facilities for all students at many open-access sites on campus, including provision for disabled access, with regular upgrades of equipment and software and management of student web accounts. There is remote access both on site and in halls of residence to the Library catalogue and other services. Some departments also maintain their own computing network, available for postgraduate student use.

In addition, the Cookson Computing Centre, based in the Faculty of Medical Sciences, has state of the art facilities with over a hundred networked microcomputers. Newcastle is one of the 14 primary sites of the UK academic super JANET network which gives excellent connections to other networks including the Internet.

The University has the equipment and facilities expected of an internationally competitive biomolecular, biomedical and micro/nano-technology research institution. The following are available to all postgraduate research students:-

- Hybrid device fabrication clean room with integrated Class II cell culture facility.

- Characterisation and analysis facilities, including scanning probe microscopies, electron microscopy, mass spectrometry and molecular biology.

The University Careers Service advisers contribute to induction meetings, highlight the support and guidance available and help students to monitor the development of key skills. The Faculty has a dedicated careers officer who is always available for consultation and contributes to teaching on the programme.

There is also a Language Centre which provides pre-sessional and in-sessional programmes for students who need support with English for academic purposes.

10 Methods for Evaluating and Improving Quality and Standards

Module reviews: Annually through Curriculum Committee.
Programme reviews: Annually through Curriculum Committee.
External examiner reports: Considered routinely by Curriculum Committee.
Accreditation reports: Not applicable.
Student evaluations: Conducted routinely.
Feedback Mechanisms: Curriculum Committee; Staff/Student committee.
Faculty and University Review Mechanisms: Taught Programme Review and Subject Review.