PROGRAMME SPECIFICATION	

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	MSc
4	**Programme Title**	Microsystems Engineering
5	**UCAS/Programme Code**	5150
6	**Programme Accreditation**	
7	**QAA Subject Benchmark(s)**	Engineering Benchmark http://www.qaa.ac.uk/academicinfrastructure/benchmark/statements/Engineering06.pdf
8	**FHEQ Level**	M-level (HE4)
9	**Date written/revised**	4th April 2007

10 Programme Aims

1) To produce Masters' level engineering graduates who are able to participate effectively in a wide variety of industrial and/or research environments in the field of microsystems engineering.
2) To enable engineering graduates to develop and widen their knowledge base in microsystems engineering to Masters level standard.
3) To enable engineering graduates to gain specialisation in either:
a) the design and fabrication methods of microelectronic devices and systems (microelectronics strand),
b) the materials, methods and applications of nanotechnology and nanoscience (nanotechnology strand),
c) the nanomaterials in healthcare technologies (nanomedicine strand).
4) To enable engineering graduates to develop generic problem solving skills applicable to microsystems engineering.
5) To enable engineering graduates to achieve more in-depth expertise in selected areas of microsystems design
6) To enable engineering graduates to engage in the planning, execution and written/oral presentation of a research orientated project.
7) To lead to a qualification conforming to the M-level (HE4) of the FHEQ.

11 Learning Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas. The programme outcomes have references to the benchmark statements for Engineering.

Knowledge and Understanding

On completing the programme students should be able to demonstrate:
A1) Knowledge of fundamental design issues relevant to systems engineering, and an understanding of how to formulate and analyse design solutions.
A2) An advanced knowledge of a broad range of modelling methodologies, and underlying mechanical science, commonly used in the development and analysis of microsystems engineering.
A3) Working knowledge of a range of modern mathematical methods and tools used in the development and analysis of microsystems engineering.
A4) Knowledge of basic research and development principles and practices relevant to the micro-engineering industry.
A5) Knowledge of key professional, safety and ethical issues arising in modern industry.

A6) Knowledge of time-management and work planning issues related to the organization, implementation and successful completion, including reporting, of an individual, Masters level, microsystems based project.

Depending on selection of optional stream, students should be able to demonstrate:
A7) In-depth knowledge of the techniques and technologies associated with microelectronics (Microelectronics stream).
A8) A working knowledge of integrating microelectronics with microsystems (IMEMS) (Microelectronics stream).
A9) In-depth knowledge of the range of current nanotechnologies (Nanotechnology stream).
A10) A working knowledge of how microsystems link this nanotechnology to the world (Nanotechnology stream).
A11) In-depth knowledge of the current biomedical nanotechnologies (Nanomedicine stream).
A12) A working knowledge of the requirements to interface these biotechnologies with the world (Nanomedicine stream).

Teaching and Learning Methods

The main mechanism for imparting the above knowledge and understanding in A1-A12 is lectures, combined with tutorials, examples classes, activities and coursework. Modules concerned with macro systems address the generic aspects of systems design with the more specialised modules addressing the advanced knowledge requirements specific to microsystems engineering. Advanced knowledge of the chosen stream is addressed through specific modules.

Students are required to support and reinforce lecture based knowledge transfer through private study, making use of recommended texts and web-based material. Tutorials allow lecture material to be discussed and supplemented, and provide a mechanism for detailed feedback to the student on coursework. Supervised project work provides the student with the opportunity to develop knowledge and understanding in an area of interest to a greater depth, and further reinforces material from the taught component of the programme.

The knowledge gained from the individual modules is coherently coupled and strengthened via the project.

Assessment Strategy

Formative assessment of student progress on taught modules is affected through the use tutorial exercises and coursework in the form of written answers to set exercises and/or case-study reports. The primary means of assessing knowledge and understanding is the closed book examination. The balance between coursework assessment and examination varies as appropriate to each module. In-depth learning and understanding acquired during work of the main project is assessed by dissertation. Interview of candidates by the external examiner is also used, where appropriate, to verify student learning.

Intellectual Skills

On completing the programme students should be able to:
B1) Interpret and critically assess existing theories, models, methods and results, both qualitatively and quantitatively, within an engineering and physical science framework.
B2) Identify, adapt and develop models appropriate to the study of a wide-range of different microsystems processes and products.
B3) Select and apply appropriate mathematical and/or numerical methods for analysing relevant problems, and to critically assess and interpret results obtained from these methods.
B4) Construct rational arguments and logically present results.
B5) Undertake an independent literature review on a specialized microsystems topic.

Teaching and Learning Methods

The intellectual skills are introduced, illustrated and explained in lectures and examples classes. Subsequent work on exercises provided in lectures, example classes, tutorials and labs reinforces these skills. Regular student attendance and participation at all formal classes is expected. More in-depth exposure to these skills is provided during work on the main project.

Assessment Strategy

Satisfactory acquisition of these intellectual skills is formally assessed through coursework (written solutions to set problems, lab reports and mini-projects) and written examination. In-course assessed work provides an important mechanism for monitoring student development through the course. Written examinations test these acquired skills and the ability to apply such skills under time constraints. B5 is assessed by project dissertation.

Practical Skills

On completing the programme students should be able to:
C1) Apply standard scientific principles to develop microsystems engineering solutions to a range of practical problems.
C2) Recognise and appreciate problems inherent in microsystems and have the ability to synthesis, and propose evaluation methods for, alternative solution strategies.
C3) Propose, formulate and present suitable design strategies and practices to tackle typical microsystems orientated problems.
C4) Undertake a microsystems project and produce a clear and detailed written report of the work.

Teaching and Learning Methods

The inculcation of practical skills takes place throughout the entire degree programme, and draws on teaching, learning and assessment strategies (as employed in tutorials, labs and project work). Project work provides an important mechanism not only for consolidating the skills introduced and developed in the taught modules, but also for developing more generic, practical skills. Supervision of project work is structured to assist students developing these practical skills. Emphasis is given to the requirement of submitting work that exhibits clear and logical presentation, with rational explanations of methods employed. In this respect the planning, execution and reporting of work undertaken during the project plays an important role in the development of these practical skills.

Assessment Strategy

Primary assessment of practical skills is via evaluation of student performance on submitted coursework (problem-solving exercises, mini-project and lab reports) and the final project, the latter being assessed through the written dissertation together with formal feedback from the project supervisor.

Transferable/Key Skills

On completing the programme students should be able to:
D1) Communicate ideas clearly, by means of both written documentation and oral presentation.
D2) Effectively utilize modern information resources and technologies.
D3) Prioritize, organize and schedule work activities effectively.
D4) Work independently or in a team environment.
D5) Demonstrate generic problem solving skills.

Teaching and Learning Methods

Proficiency in key skills D1-D5 is addressed directly by taught material forming part of the MEC8011 Methods in Industrial Research and Development module, which is aimed at teaching generic skills and methods commonly used in industrial R&D. This material covers presentation and writing skills (D1), use of library and other information resources (D2), and work management (D3). Further, students will undertake both individual and group problem-solving activities within this module to assist in developing key skills D4-D5. Students who are not native speakers of English usually receive additional instruction related to D1 by registering for the INTO Newcastle University module Writing Dissertations in Science & Engineering. Feedback on student performance assists the learning process. In addition to the key-skill-specific taught material, students will develop these skills through participation in other aspects of the programme. These skills are also required in other, subject specific modules, and active participation in these modules will further aid key skill development. Project based work is central in the teaching strategy for D1-D3. Successful completion of the final project (MEC8095) will require that a student is developing and applying these skills.

Assessment Strategy

Key-skill development is formally assessed in module MEC8011. Assessment is through performance demonstrated by written work and by oral presentations. The key skills are also indirectly assessed through performance on coursework for other modules and on the project MEC8095.

12 Programme Curriculum, Structure and Features

Basic structure of the programme

This is a full-time one year (three semester) programme starting in September and finishing in August, leading to the award of the Degree of Master of Science.

A total of 180 credits are required, these are distributed as follows:

- 80 credits of compulsory modules.
- 40 credits of optional modules chosen from a particular 'stream' of either microelectronics, nanotechnology or nanomedicine.
- 60 credit project.

Key features of the programme (including what makes the programme distinctive)

The key feature of this programme is its multidisciplinary nature. The desirability of this multidisciplinary learning is a priority noted by EPSRC. It is achieved by modules being taught across three SAgE schools and two Faculties (SAgE & FMS).

To ease the burden of timetabling, the course is structured with 80 credits of compulsory modules and 40 credits of options. Students chose of one of three streams – Microelectronics, Nanotechnology or Nanomedicine. A 60 credit project will also reflect the choice of stream. The projects will be research based and will add to the equipment infrastructure of the laboratories.

Programme regulations (link to on-line version)

See Annex II
(http://www.ncl.ac.uk/regulations/programme/2007-2008/programme/F150php.php

13 Criteria for admission

Entry qualifications

Applicants for this MSc should have a good Honours level (minimum 2:2) first degree (or equivalent) in an appropriate engineering, science, mathematics or industrial business discipline, wishing to broaden and extend their study to a higher level.

Admissions policy/selection tools

Applicants must apply through Newcastle University Enquiries to Registration System: https://pgadmissions.ncl.ac.uk

Non-standard Entry Requirements

Applicants who hold non-standard qualifications and/or have relevant professional experience requiring the regular exercise of Level H engineering knowledge, skills and understanding, may be considered on an individual basis and may be required to attend for interview if practical.

Level of English Language capability

For non-native speakers of English not otherwise exempted from the requirements of the University English Language Policy, the normal English language attainment required shall be 6.5 on the IELTS scale (or equivalent) or 65 on the INTO Newcastle University language test.

14 Support for Student Learning

Induction

During the first week of the first semester students attend an induction programme. New students will be given a general introduction to University life and the University's principle support services and general information about the School and their programme, as described in the Degree Programme Handbook. New and continuing students will be given detailed programme information and the timetable of lectures/practicals/labs/ tutorials/etc. The International Office offers an additional induction programme for overseas students (see http://www.ncl.ac.uk/international/coming_to_newcastle/orientation.phtml)

Study skills support
Students will learn a range of Personal Transferable Skills, including Study Skills, as outlined in the Programme Specification. Students are explicitly tutored on their approach to both group and individual projects.

Academic support
The initial point of contact for a student is with a lecturer or module leader, or their tutor (see below) for more generic issues. Thereafter the Degree Programme Director or Head of School may be consulted. Issues relating to the programme may be raised at the Staff-Student Committee, and/or at the Board of Studies.

Pastoral support
All students are assigned a personal tutor whose responsibility is to monitor the academic performance and overall well-being of their tutees. In addition the University offers a range of support services, including one-to-one counselling and guidance or group sessions/workshops on a range of topics, such as emotional issues eg. Stress and anxiety, student finance and budgeting, disability matters etc. There is specialist support available for students with dyslexia and mental health issues. Furthermore, the Union Society operates a Student Advice Centre, which can provide advocacy and support to students on a range of topics including housing, debt, legal issues etc.

Support for students with disabilities
The University's Disability Support Service provides help and advice for disabled students at the University - and those thinking of coming to Newcastle. It provides individuals with: advice about the University's facilities, services and the accessibility of campus; details about the technical support available; guidance in study skills and advice on financial support arrangements; a resources room with equipment and software to assist students in their studies. For further details see http://www.ncl.ac.uk/disability-support/

Learning resources
The University's main learning resources are provided by the Robinson and Walton Libraries (for books, journals, online resources), and Information Systems and Services, which supports campus-wide computing facilities, see http://www.ncl.ac.uk/undergraduate/support/acfacilities.phtml

All new students whose first language is not English are required to take an English Language Proficiency Test. This is administered by INTO Newcastle University Centre on behalf of Newcastle University. Where appropriate, in-sessional language training can be provided. The INTO Newcastle University Centre houses a range of resources which may be particularly appropriate for those interested in an Erasmus exchange. See http://ncl.ac.uk/langcen/index.htm

15 Methods for evaluating and improving the quality and standards of teaching and learning

Module reviews
All modules are subject to review by questionnaires which are considered by the Board of Studies. Changes to, or the introduction of new, modules are considered at the School Teaching and Learning Committee and at the Board of Studies. Student opinion is sought at the Staff-Student Committee and/or the Board of Studies. New modules and major changes to existing modules are subject to approval by the Faculty Teaching and Learning Committee.

Programme reviews
The Board of Studies conducts an Annual Monitoring and Review of the degree programme and reports to Faculty Teaching and Learning Committee.

External Examiner reports
External Examiner reports are considered by the Board of Studies. The Board responds to these reports through Faculty Teaching and Learning Committee. External Examiner reports are shared with institutional student representatives, through the Staff-Student Committee.

Student evaluations
All modules, and the degree programme, are subject to review by student questionnaires. Informal student evaluation is also obtained at the Staff-Student Committee and the Board of Studies.

Mechanisms for gaining student feedback
Feedback is channelled via the Staff-Student Committee and the Board of Studies.

Faculty and University Review Mechanisms
The programme is subject to the University's Internal Subject Review process, see http://www.ncl.ac.uk/aqss/qsh/internal_subject_review/index.php

Accreditation reports
All existing MSc programmes were accredited by IMechE and approved by IET in October 2006. Programmes which are introduced after this date will be considered for Accreditation at the next visit in 2010.

16 Regulation of assessment

Course requirements
The pass mark is 50. Progression is subject to the University's Masters Degree Progress Regulations, Taught and Research (http://www.ncl.ac.uk/calendar/university.regs/tpmdepr.pdf) and Examination Conventions for Taught Masters Degrees (http://www.ncl.ac.uk/calendar/university.regs/tpmdeprexamconv.pdf). Limited compensation up to 40 credits of the taught element and down to a mark of 40 is possible and there are reassessment opportunities, with certain restrictions.

Common Marking Scheme
The University employs a common marking scheme, which is specified in the Taught Postgraduate Examination Conventions, namely:

Summary description applicable to postgraduate Masters programmes

<50	Fail
50-59	Pass
60-69	Pass with Merit
70 or above	Pass with Distinction

Role of the External Examiner
An External Examiner, a distinguished member of the subject community, is appointed by Faculty Teaching and Learning Committee, after recommendation from the Board of Studies. The External Examiner is expected to:

- See and approve examination papers
- Moderate examination and coursework marking
- Attend the Board of Examiners
- Report to the University on the standards of the programme

In addition, information relating to the programme is provided in:
The University Prospectus (see http://www.ncl.ac.uk/postgraduate/) The School Brochure (contact enquiries@ncl.ac.uk) The University Regulations (see http://www.ncl.ac.uk/calendar/university.regs/) The Degree Programme Handbook (see http://www.ncl.ac.uk/mech/postgrad/taught/)

Please note. This specification provides a concise summary of the main features of the programme and of the learning outcomes that a typical student might reasonably be expected to achieve if she/he takes full advantage of the learning opportunities provided. The accuracy of the information contained is reviewed by the University and may be checked by the Quality Assurance Agency for Higher Education.

Annex I

Mapping of Intended Learning Outcomes onto Curriculum/Modules

		Intended Learning Outcomes			
Module	**Type**	**A**	**B**	**C**	**D**
MEC8012	Comp	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12	1, 2, 4, 5	1, 2, 3, 4	1, 2, 3, 4, 5
MEC8011	Comp	4, 5, 6	3, 4		1, 2, 3, 4, 5
MEC8001	Comp	1, 3, 4	1, 3, 4	1, 2, 3	1, 2, 3, 4, 5
EEE8022	Comp	1, 3, 4, 5	1, 3, 4	1, 3	1, 3, 4, 5
MEC8002	Comp	1, 2, 3, 4	1, 2, 3	1, 2	1, 3, 4, 5
LCE8014	Comp: Either		4		1, 2, 3, 4, 5
EEE8033	Comp: or	1, 4, 5, 7, 9, 11			1, 2, 3, 4, 5
MEC8095	Comp	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	1, 2, 3, 4, 5	1, 2, 3, 4	1, 2, 3, 4, 5
EEE8018	Opt	1, 2, 4, 5, 7, 8	1, 2	1, 2, 3	1, 2, 5
EEE8011	Opt	1, 2, 3, 4, 5, 7, 8	1, 2	1, 2, 3	1, 5
EEE3009	Opt	1, 2, 3, 4, 5, 7, 8	1, 2, 3	1, 2, 3	1, 2, 4, 5
CME4004	Opt	1, 2, 4, 5, 9, 10	1, 2, 4, 5	1, 2, 3	1, 2, 3, 4, 5
CME4005	Opt	1, 2, 4, 5, 9, 10	1, 2, 4, 5	1, 2, 3	1, 2, 3, 4, 5
CME8034	Opt	1, 2, 3, 4, 5, 9, 10	1, 2, 3, 4, 5	1, 2, 3	1, 2, 3, 4, 5
CME8017	Opt: Either	1, 2, 3, 10	1, 2, 3, 4	1, 2, 3	1, 2, 3, 4, 5
ENG8002	Opt: or	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3	1, 2, 3, 4, 5
SUR8015	Opt	1, 2, 4, 5, 11, 12	1, 2, 4, 5	1, 2, 3	1, 2, 3, 4, 5
MEC4002	Opt	1, 2, 3, 4, 5, 11, 12	1, 2, 3, 4		1, 3, 4, 5
ENG8002	Opt	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3	1, 2, 3, 4, 5