PROGRAMME SPECIFICATION	

1 Awarding Institution	Newcastle University
2 Teaching Institution	Newcastle University
3 Final Award	MSc
4 Programme Title	Master of Science in Mechatronics
5 UCAS/ Programme Code	5095F
6 Programme Accreditation	IMechE and IET 2006
7 QAA Subject Benchmark(s)	Engineering Benchmark (http://www.qaa.ac.uk/ academicinfrastructure/benchmark/statements/Engineering06.pdf) MEng Degrees – Annex to Academic Standards UK Spec (http://www.engc.org.uk/UKSPEC/default.aspx)
8 FHEQ Level	
9 Date written/revised	Written July 2004. Revised April 2005, July 2006, September 2007

10 Programme Aims

The programme aims to enable suitably qualified graduates from a range of engineering backgrounds to

1. Develop knowledge, skills (including transferable skills) and understanding, as well as awareness and "know how", in the fields of mechanical engineering with mechatronics and its related disciplines (materials, electrical, electronic and computer engineering) so that as graduates they will be equipped to enter employment as professional engineers (progressing on to Chartered Engineer or equivalent status) or a wide range of other professional careers.
2. Prepare them to engage in life-long learning (eg professional CPD or further Higher Education) and critical enquiry with skills in research and knowledge acquisition and an appreciation of the value of education to the wider community.
3. Provide them with internationally recognised qualifications which meet the requirements of the Framework for Higher Education Qualifications at Level M and of the subject Benchmark Statement for Engineering (Applicability of Output Standards to MEng Degrees) and of the Engineering Council UK, UKSpec for CEng accredited Integrated Masters Degrees.
4. Provide the engineering industry and profession, in the UK and elsewhere, with employable and enterprising graduates prepared for the assumption of technical, managerial and financial responsibilities.
5. Achieve the above in the contexts of the School, SAgE Faculty and University business plans, following the University's policies and procedures and conforming to the relevant sections of the QAA Code of Practice

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 Advanced knowledge of a broad range of modelling methodologies, and underlying mechanical science, commonly used in the development and analysis of mechatronic engineering systems.

A2 Knowledge of fundamental design issues relevant to mechatronic engineering, and an understanding of how to formulate and analyse design solutions in various engineering contexts.

A3 Working knowledge of a range of modern mathematical methods and tools used in the development and analysis of mechatronic engineering systems.

A4 In-depth knowledge of one or more of the following (depending of selection of option modules and project area): specific engineering systems, design methods, modelling techniques, mathematical and/or numerical techniques.

A5 Knowledge of basic research and development principles and practices relevant to mainstream engineering industry.

A6 Knowledge of key professional, safety and ethical issues arising in modern engineering industry.

A7 Knowledge of time-management and work planning issues related to the organisation, implementation and successful completion, including reporting, of an individual, Masters level, engineering based project.

Teaching and Learning Methods

The main mechanism for imparting the above knowledge and understanding in A1-A6 is lectures, combined with tutorials, examples classes, activities and coursework. Design labs and CAD sessions are used for A2, whilst microprocessor labs form part of the teaching methods for some of the numerically orientated option modules (A4). In-depth knowledge outcomes in A4 are also achieved via project work, as is outcome A7. Outcome A6 is also supported by project based experience in many cases.

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.

Assessment Strategy

Formative assessment of student progress on taught modules is effected through the use tutorial exercises and coursework in the form of written answers to set exercises and/or case-study reports. The primary, summative 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 assess student learning.

Intellectual Skills

On completing the programme students should be able to:

B1 Identify, adapt and develop models appropriate to the study of a wide-range of different mechatronic engineering type systems, processes and products.

B2 Apply standard scientific principles to develop mechatronic engineering solutions to a range of practical problems.

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 Propose, formulate and present suitable design strategies and practices to tackle typical mechatronic engineering orientated problems.

B5 Undertake an independent literature review on a specialised engineering topic.

B6 Produce a clear and detailed written report of engineering project work.

Teaching and Learning Methods

Skills B1-B4 are introduced, illustrated and explained in lectures and examples classes. Subsequent work in tutorials and labs reinforces these skills. More in-depth exposure to skills B1-B4 is provided during work on the main project, which is also central to the strategy for teaching B5-B6. Key transferable skills underpinning B5-B6 are introduced in the taught component of the programme, serving as preparation for project work.

Skills B1-B4 are developed through work on exercises provided in lectures, example classes, tutorials and labs. Regular student attendance and participation at all formal classes is expected and required. Acquisition of B1-B4 is also through application and extension of taught material to project work, which provides the main mechanism for developing skills B5-B6.

Assessment Strategy

Satisfactory acquisition of skills B1-B4 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 skill acquisition and the ability to apply such skills under time constraints. B5-B6 are assessed by project dissertation.

Practical Skills

On completing the programme students should be able to:

C1 Interpret and critically assess existing theories, models, methods and results, both qualitatively and quantitatively, within an engineering and physical science framework.

C2 Recognise and appreciate the problems inherent in a mechatronic engineering system or approach, and demonstrate the ability to synthesise, and propose evaluation methods for, alternative solution strategies.

C3 Develop and construct a rational argument and the logical presentation of results.

Teaching and Learning Methods

The inculcation of cognitive skills C1-C3 takes place throughout the entire degree programme, and draws on teaching, learning and assessment strategies (as employed in lectures, tutorials, labs and project work) described in A and B above. Project work provides an important mechanism not only for consolidating the technical information and learning outcomes introduced and developed in the taught modules, but also for developing more generic, cognitive skills by drawing on the body of these experiences and learning outcomes.

Supervision of project work is structured to assist students develop their learning skills. Students are encouraged to adopt a critical and logical approach when interpreting the methods and ideas presented and discussed in the programme. 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 and important role in the development of cognitive

skills.

Assessment Strategy

Primary assessment of cognitive skills is via evaluation of student performance on submitted coursework (problem-solving exercises, mini-project and lab reports) and the final project, the later being assessed through the written dissertation together with formal feedback from the project supervisor. Written examinations for the taught modules also provide a mechanism for assessing the development of cognitive skills.

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 utilise modern information resources and technologies.

D3 Prioritise, organise 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 module *Methods In Industrial Research and Development,* 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 skill D4-D5. Students who are not native speakers of English usually receive additional instruction related to D1 by registering for the Language Centre module *Writing Dissertations in Science & Engineering*. In addition to the key-skill-specific taught material, students will develop these skills through participation in other aspects of the programme. In particular project based work is central in the teaching strategy for D1-D3.

Key skills D1-D5 are formally taught, and feedback on student performance assists the learning process. These skills are also required in other, subject specific modules, and active participation in these modules will further aid key skill development. Successful completion of the final project will require that a student is developing and applying these skills.

Assessment Strategy

Key-skill development is formally assessed in the module *Methods In Industrial Research and Development.* 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 final project.

12 Programme Curriculum, Structure and Features

Basic structure of the programme

The taught component of the programme consists of a total of 120 credits (1 credit ≡10 study hours, including timetabled contact hours and private study) studied during Semesters 1 and 2 (September to June). Students begin preliminary work (eg literature review etc) on their 60 credit major project in Semester 1, with work continuing throughout the year and being completed in Semester 3 (June – September). Project work must be submitted for assessment by the beginning of October.

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

This is a full-time, one year (three semesters) programme, starting in September, leading to the award of the degree of Master of Science (MSc).

The degree covers a range of mechatronic engineering topics, with the opportunity to apply these in the major project.

All students will normally follow a compulsory 10 credit module on Methods in Industrial Research and Development. Non-native speakers of English will normally also follow a compulsory 10 credit module on Writing Dissertations in Science and Engineering. All students will undertake a major (60 credit) project, which usually involves laboratory based work and/or modelling and numerical studies and/or design (with considerable scope for industrial involvement in projects).

Programme regulations (link to on-line version)

See Annex II
http://www.ncl.ac.uk/regulations/programme/

13 Criteria for admission

Entry qualifications
Applicants for this MSc should have a good Honours level first degree or equivalent in a relevant engineering discipline.

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.

Additional Requirements

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.

Study skills support
Students will learn a range of Personal Transferable Skills, including Study Skills, as outlined in the Programme Specification. Some of this material, e.g. time management is covered in the appropriate Induction Programme. Students are explicitly tutored on their approach to

both group and individual projects. Help with academic writing is available from the Writing Centre.

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..

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.html

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. The National Student Survey is sent out every year to final-year undergraduate students, and consists of a set of questions seeking the students' views on the quality of the learning and teaching in their HEIs. With reference to the outcomes of the NSS and institutional student satisfaction surveys actions are taken at all appropriate levels by the institution.

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.

Mapping of Intended Learning Outcomes onto Curriculum/Modules

		Intended Learning Outcomes			
Module	**Type**	**A**	**B**	**C**	**D**
MEC8001	Comp	1, 2, 3, 4, 5	1, 2, 3, 4, 5	1, 2, 3	1, 2, 3, 4, 5
MEC8002	Comp	1, 2, 3, 4, 5	1, 2, 3, 4, 5	1, 2, 3	1, 3, 5
MEC8007	Comp	2, 3, 4, 6	2, 3 ,4, 5	1, 2	1, 2, 4, 5
MEC8011	Comp	5, 6, 7		2, 3	1, 2, 4
MEC8095	Comp	1, 2, 3, 4, 5, 6, 7	1, 2, 3, 4, 5, 6	1, 2, 3	1, 2, 3, 4, 5
EEE8022	Comp	1, 3, 4, 5	1, 3, 4	1, 3	1, 2, 5
EEE8006	Comp	1, 2, 3, 4, 5	2, 3, 4		1, 2, 3, 4, 5
LCE8014	Comp: Either		5, 6		1, 2, 3, 4, 5
EEE3009	Opt	1, 2, 3, 4, 5	1, 2, 3	1, 2, 3	1, 2, 4, 5
EEE8001	Opt	1, 3, 4	2, 3, 4	1, 2	2, 3, 5
EEE8005	Opt	2, 3, 4, 6	2, 3, 4, 5	1, 2	1, 2, 4, 5
EEE8007	Opt	1, 2, 3, 4, 5	1, 2, 3	1, 2, 3	1, 2, 4, 5
EEE8011	Opt	1, 3, 4	2, 3, 4	1, 2	2, 3, 5
EEE8012	Opt	2, 3, 4, 6	2, 3, 4, 5	1, 2	1, 2, 4, 5
EEE8014	Opt	2, 3, 4, 6	2, 3, 4, 5	1, 2	1, 2, 4, 5
MEC4005	Opt	2, 3, 4, 5	2, 3, 4	2, 3	1, 2, 4
MEC8004	Opt	2, 3, 4, 5	2, 3, 4	2, 3	1, 2, 4
MEC8003 or	Opt	1, 2, 3, 5	2, 3, 4	1, 2	1, 2, 5
MEC8009	Opt	1, 2, 3, 4, 5	2, 3, 4	1, 2, 3	1, 2, 5
MEC8010	Opt	1, 3, 4, 5	2, 3, 4	1, 2, 3	1, 2, 5
ENM8002 or	Opt: or	3, 4,	2, 3, 4	1, 3	1, 2, 3, 4, 5
ENG3003		3, 4	2, 3, 4	1, 3	2, 3, 4, 5