PROGRAMME SPECIFICATION	

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	MSc / Postgraduate Diploma
4	**Programme Title**	Mechanical Properties of Solids
5	**UCAS/Programme Code**	5094 (1-year); 5132 (2-year)
6	**Programme Accreditation**	None
7	**QAA Subject Benchmark(s)**	Engineering
8	**FHEQ Level**	M
9	**Date written/revised**	September 2007

10 Programme Aims

The course aims to give engineering graduates a familiarity with current engineering materials, so that the combination of the new materials know-how with their existing engineering skills will equip them to play an informed role in the design and use of materials in the current industrial scene.

Specifically, the course aims to give advanced knowledge and subject-specific/cognitive skills in:

(a) new materials in the fields of metals, ceramics, polymers and composites,

(b) procedures for the design of components for specific applications. This includes property selection, choice of fabrication route, design of shape, use of post-treatments for property optimisation, lifetime considerations (including effects of the environment and in-service conditions) as well as density, cost and aesthetic factors.

(c) microstructure, and how it can be tailored to achieve a desired combination of mechanical properties,

(d) modern techniques for physical, chemical and microstructural analysis of engineering materials.

In addition to the above, the course aims to equip students with a range of key/transferable skills, i.e. communication – both written and oral, the ability to employ IT and library resources, the ability to work alone (managing a varying workload and meeting deadlines) and as part of a team, and the ability to problem solve in the field of engineering materials.

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

A successful student will have gained and be able to demonstrate:

A1. Knowledge and advanced understanding of the relevant mathematics and engineering science appropriate to current engineering materials.

A2. Knowledge of IT and relevant software packages applied to materials science, especially relating to engineering design (including relevant codes of practice).

A3. Advanced knowledge of the properties of engineering materials

A4. Where relevant, an understanding of management principles and business practices; also an awareness of requirements for safe usage and operation of materials.

Teaching and Learning Methods

Teaching Strategy

A1 and A3 are imparted primarily through lectures. Safe usage of materials (A4) features frequently throughout the course, especially in the Case Study modules, and in practical

aspects of project work; business aspects (A4) feature in the two business modules. A2 is covered in the stress analysis course and also in the Joining Technology, and Materials and Tribology modules.

Learning Strategy

In all taught modules, a large fraction of each module is associated with private study, which includes going through lectures notes and making reference to the additional material specified either directly by the teaching staff, or from the student's individual reading (A1-A4). The two Case Study modules specifically direct students to technical information about materials which they can assimilate and then present either as a written report or orally (A1 and A3).

Assessment Strategy

Knowledge and understanding (A1-A4) are all assessed by means of unseen written examinations. In addition, some of the modules include assessed calculation sheets and others involve written coursework. The written exam papers test understanding of principles and the ability to perform calculations and understand the significance of the conclusions. The Case Study courses involve assessed oral presentations. The knowledge and understanding acquired during the project is assessed from the dissertation and in the viva examination.

Intellectual Skills

A successful student will be able to:

B1. Apply mathematical procedures and materials science principles to specific materials scenarios.

B2. Use scientific principles to model the selection, processing and product development in materials, and to be able to handle unfamiliar and problematic situations

B3. Have a familiarity with relevant analytical techniques, and their application to inform about the composition, quality and limitations of materials.

B4 Generate new ideas aimed at designing new materials for new and possible unconventional product applications.

Teaching and Learning Methods

Teaching Strategy

Understanding and experience of the practices and techniques used in materials science (B1-B3) are taught in lectures. Materials design features in many modules, and this strongly involves all the points B2-B4. In lectures, students are also introduced to a range of analytical tools, which they become familiar with (B1) and learn the limitations of (B3)

Learning Strategy

The material presented in lectures is supported where relevant by calculation sheets and computer-based learning exercises (B1). In the Case Study courses, students see how these principles are carried out in practice, and how difficulties are overcome (B2). In their projects, students get hands-on experience of the application of all these principles (B1-B4) as applied to specific materials and also of relevant analytical techniques.

Assessment Strategy

Most of these skills are tested by unseen examinations. The application of materials science principles to specific materials is studied in the Case Study modules, in which the students make oral presentations (and produce additional written reports). The project dissertation and viva also indicate how students have applied these skills to the specific subject of study of their project.

Practical Skills

A successful student will have developed:

C1. Skill and experience in the use of mathematical and engineering science procedures as applied to materials.

C2. Skill in using analytical methods and IT tools, and an awareness of their limitations

C3. A skill in testing out design ideas through laboratory work, using relevant measuring equipment and
in so doing developing an ability to critically assess the reliability of results.
C4. An ability to research information and evaluate/apply this to a specific materials application.
C5. The ability to manage a project, including the monitoring and managing of a personal programme of work.

Teaching and Learning Methods

Teaching Strategy
Students develop all the above cognitive skills (C1-C5) whilst carrying out their projects. Here they can take the knowledge and understanding acquired in the lectures, coupled with the ability to apply these in the materials field as outlined in B above. The teaching process is assisted by the students in most cases being linked up with on-going research projects in the School.

Learning Strategy
In the projects, students collate/examine data relating to the behaviour of a particular group of materials. Analytical methods are involved (C2) and these are used to test out ideas (C3), which requires them to process results (C4), and then manage the overall results in an output in the form of a dissertation (C5). The presence of researchers in the materials group familiar with the procedure allows the student to learn these procedures very quickly and effectively.

Assessment Strategy

Students produce a 50-60 page dissertation summarising their project work, which is assessed by members of staff, and which they defend by viva voce examination. In many courses the subject of the project will have been familiar to the student from lectures, and the carrying out of the project will serve to familiarise many topics which come up in the unseen examinations.

Transferable/Key Skills

On completing the programme students should be able to:

D1 Communicate clearly and effectively on materials topics both in written reports and oral presentations.
D2 Solve problems, including the ability to be creative and innovative, and be able to find the most appropriate solution in the case of contradictory and often incomplete data.
D3 Use IT resources and integrate presentational techniques for maximum impact
D4 Use library facilities and be able to employ these and other reference materials to research particular topics in the materials field.
D5 Organise a workload of varying tasks and meet imposed deadlines.

Teaching and Learning Methods

Teaching Strategy
During induction week, students are informed about library, IT and computing facilities (D3), since use of these is involved in many items of assessed work. Throughout the course, the selection and use of materials is often presented in the context of solving problems (D2); the tribology and joining technology courses particularly major on this, and reasons for the use of particular materials are general backed up by appropriate mathematical and scientific arguments. The two Case Study courses give students experience in D1 and D4. Both the Case Study courses and the Project give students experience in planning tasks and meeting deadlines (D5).

Learning Strategy
Students are given practice throughout the year in report writing, giving talks, and then in their project, collecting data and converting this into a well-structured report (D1, D3). The project also gives opportunities for exploring all aspects of D2. Their experience of rapid assimilation of information followed by presentation (as a short talk or report) in the Case Study modules

aims to simulate the real life situation which often arises in industry (D1, D4). D5 is most effectively communicated by “doing”, and the project provides the perfect opportunity for gaining practice in this area.

Assessment Strategy

Key skills are not examined by a formal examination procedure, but students’ abilities in oral presentation (including use of overheads/power point and handling discussion) is assessed in the Case Study courses (D1, D3); their report writing is assessed by in-course assessments in many of the modules. Producing the final project dissertation will develop both D5 and D4, and will give real experience of putting into practice what has been learnt about D2 from the taught courses. The ability of students to explain themselves and argue a point of view is tested in the viva voce examination.

12 Programme Curriculum, Structure and Features

Basic structure of the programme

The Mechanical Properties of Solids M.Sc is a full-time programme available in either a 1-year or a 2-year format. Most students are expected to take the 1-year format, and the 2-year modification is available for those who although able to matriculate because of prior qualifications, have other limitations (especially in English language skills) and are able to spend 2-years over the degree. The 1-year programme consists of 120 credits of taught (compulsory) components, presented in Semesters 1 and 2 of the Academic Year, followed by a 60 credit project, notionally attributed to the summer period, but in practice a considerable proportion of the work needs to be undertaken before the June examinations. The project is submitted by mid-August, to allow time for the Examination Board meeting in late August/early September. Most modules are taught at the rate of one or two lectures per week throughout the year. Students choose project topics from a list provided by the Degree Programme Director at around Christmas time. It is possible for students to suggest their own topics of study provided these are approved by the Degree Programme Director. Generally, in projects, students work alongside post-graduate or post-doctoral researchers, and attend supervision meetings with their supervisor at regular intervals. Occasionally projects involve local industry, in which case the student will visit the industrial company, and a representative of the company will attend project supervision meetings.

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

Knowledge and skills relevant to advanced materials are taught in the materials science modules (covering Tribology, Reliability, Corrosion and Joining Technology), the principles acquired being illustrated by a Case Studies module and extended into engineering applications in the Stress Analysis and Manufacturing Technology (MMM452/462) modules. Information passed on in lectures is reinforced by calculation and tutorial classes in which students have the opportunity to apply what they have learned in the lectures. A business strand underpins the course, including one oriented towards the effect of industrial activity on the environment. The Case Studies module allows students to research specific subject areas, and then present their results both orally and in the form of structured technical reports, thereby developing a range of presentational skills, which are a useful precursor for the individual project. The latter is the main vehicle for allowing students to carry out an independent programme of research in a specific area of materials activity, and this develops a range of useful transferable skills.

A mapping of Intended Learning Outcomes versus modules is shown in the table below.

Programme regulations (link to on-line version)

http://www.ncl.ac.uk/regulations/programme/2007-2008/programme/5094.php
http://www.ncl.ac.uk/regulations/programme/2007-2008/programme/5132.php

13 Criteria for admission

Standard entrance criteria

Applicants should have a 2nd class honours degree or better from a U.K. university, or the equivalent from an overseas institution. In exceptional cases, students with lower

qualifications are considered. Students should have their first degree in an engineering or engineering-related subject, in which materials science or materials engineering has been included as a module in the first two years of the course. Candidates with first degrees in chemistry, physics or other related science subjects can also be considered.

Admissions policy

UK-based applicants who meet the entrance requirements outlined above are generally invited on receipt of the Application form to come up for interview – especially if they request this, or if there are other reasons why they wish to visit the school/university. Candidates supply names of referees, and at least one satisfactory reference is obtained. Under normal circumstances, suitably qualified applicants are always offered a place.

Overseas students (who from the largest number of applicants) are not invited for interview, and are offered a place on the course if their qualifications are equivalent to those listed above for UK students, and their level of English is consistent with the University requirements for overseas students, i.e. an IELTS score of at least 6.5 or a TOEFL score of 575 or above.

Arrangements for non-standard entrants

Any candidates in this category are considered on an individual basis.

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.

Numeracy support is available through Maths Aid.

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.

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.

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. Every five years degree programmes in each subject area are subject to periodic review. This involves both the detailed consideration of a range of documentation, and a two-day review visit by a review team which includes an external subject specialist in addition to University and Faculty representatives. Following the review a report is produced, which forms the basis for a decision by University Teaching and Learning Committee on whether the programmes reviewed should be re-approved for a further five year period.

Accreditation reports
None

Additional mechanisms
N/A

16 Regulation of assessment

Pass mark
The pass mark is 50

Course requirements
Progression is subject to the University's Masters Degree Progress Regulations, Taught and Research and Examination Conventions for Taught Masters Degrees. 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.

Weighting of stages
In the 2-year programme, the overall mark for the first year does not contribute towards the final assessment. However, it is a requirements of this programme that students all pass the first year (50).

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		**Summary description applicable to postgraduate Certificate and Diploma programmes**	
<50	Fail	<50	Fail
50-59	Pass	50 or above	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/undergraduate/ or 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

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

Mapping of Intended Learning Outcomes onto Curriculum/Modules

1-year programme

A1	Maths/Engineering Science relevant to new materials	CME8042, CME8031, CME4001, CME8032, CME8033, CME8095, MEC4008
A2	IT/software/Design information relevant to new materials	CME8031, CME4001, CME8032, CME8095, MEC4008
A3	In-depth knowledge of properties of new materials	CME8042, CME8031, CME4001, CME8032, CME8033, CME8095, MEC4008
A4	Management/business/professional/ethical and health and safety procedures appropriate for new materials	BUS3010,CME8042, CME4001, CME8033, CME8012, CME8095, MEC4008
B1	Application of maths/engineering science to new materials	CME8031, CME4001, CME8032, CME8033, CME8095, MEC4008
B2	Modelling of synthesis/processing/product development in new materials	CME8042,CME8031, CME4001, CME8032, CME8095
B3	Understanding the limitations of new materials	CME8042,CME8031, CME4001, CME8032, CME8033, CME8012, CME8095, MEC4008
B4	Generating new ideas for materials design – especially for unconventional product applications.	CME8042,CME8031, CME4001, CME8032, CME8033, CME8012, CME8095, MEC4008
C1	Skill/experience in the application of maths and science procedures for new materials	CME8031, CME4001,CME8032, CPE8033, CME8095, MEC4008
C2	Using IT procedures for design; use of analytical techniques.	CME8031, CME4001, CME8032, CME8095, MEC4008
C3	Testing design ideas in lab work; developing a critical approach to assessment.	CME4001, CME8032, CME8012, CME8095
C4	Ability to research information in the materials context	CME8042, CME8012, CME8095, MEC4008
C5	Project management – including monitoring and managing a detailed personnel programme of work	BUS3010, CME8012, CME8095
D1	IT, communication and writing skills	BUS3010, CME8042, CME8012, CME8095
D2	Project management – including resource/Time management	CME8012, CME893
D3	Problem solving – development of creative + innovatory procedures for handling unsatisfactory data	CME8042, CME8031, CME8033, CME8095, MEC4008
D4	Integrating presentational techniques for maximum impact	CME8042, CME8095
D5	Developing techniques for effective learning including a CPD mentality	CME8042, CME8095

2-year programme

The Intended Learning Outcomes for the second year of the 2-year programme are the same as those given above for the 1-year programme. The Outcomes for the first year of the 2-year programme are as follows:

A1	Maths/Engineering Science relevant to new materials	CME8039, CME4003, CME8034, CME8096
A2	IT/software/Design information relevant to new materials	CME8039, CME8096
A3	In-depth knowledge of properties of new materials	CME8039, CME8038, CME4003, CME8096, CME8034
A4	Management/business/professional/ethical and health and safety procedures appropriate for new materials	CME8038, CME4003, CME8096
B1	Application of maths/engineering science to new materials	CME8039, CME8096, CME881
B2	Modelling of synthesis/processing/product development in new materials	CME8039, CME8038, CME8096, CME4003, CME8034
B3	Understanding the limitations of new materials	CME8039, CME8038, CME4003, CME8096, CME8034
B4	Generating new ideas for designing new materials, including unconventional product applications.	CME8039, CME8038, CME4003, CME8096, CME8034
C1	Skill/experience in the application of maths and science procedures for new materials	CME8096
C2	Using IT procedures for design; use of analytical techniques.	CME8039, CME8096
C3	Testing design ideas in lab work; developing a critical approach to assessment.	CME8096
C4	Ability to research information in the materials context	CME8039, CME8038, CME4003, CME8096
C5	Project management – including monitoring and managing a detailed personnel programme of work	CME8096
D1	IT, communication and writing skills	LCEXXXX, LCE8014, CME4003, CME8096
D2	Project management – including resource/Time management	LCE8014, CME8096
D3	Problem solving – development of creative + innovate procedures for handling unsatisfactory data	CME8039, CME8038, CME4003, CME8096, CME8034
D4	Integrating presentational techniques for maximum impact	LCEXXXX, LCE8014, CME4003, CPE8096
D5	Developing techniques for effective learning including a CPD mentality	LCEXXXX, LCE8014, CME4003, CME8096

LCEXXXX: Language module to be selected by the language school as appropriate.