CONFIDENTIAL

EXAMINERS' REPORTS 2012

[Abridged version for Ox-only website]

MATERIALS SCIENCE (MS)
MATERIALS, ECONOMICS & MANAGEMENT (MEM)

REPORT ON PRELIMINARY EXAMINATION IN MATERIAL SCIENCE

Part I

A. STATISTICS

Category	Number			Percentage		
	2011/12	2010/11	2009/10	2011/12	2010/11	2009/10
Distinction	6	13	8	23	38	27
Pass	20	20	20	77	59	67
Fail	0	1*	2*	0	3	6

* Passed the resit in September
One further candidate passed the entire 2009/10 examination in September.

Marking of scripts

Scripts are single marked except for borderline cases which are double-marked.

B. NEW EXAMINING METHODS AND PROCEDURES

This year, the course lecturers suggested questions, with supporting model answers.

C. Please list any changes in examining methods, procedures and conventions which the examiners would wish the faculty/department and the divisional board to consider.

The examiners agreed that late submission of coursework should incur an academic penalty and the examiners are minded to follow the same scale as that for the Final Honours School.

D. Please describe how candidates are made aware of the examination conventions to be followed by the examiners

Circulation by Deputy Administrator (Academic) to all students and tutors by e-mail, hard copy, and onto the Departmental website.

A copy of the conventions for this examination is attached below.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

26 students were registered for the examination.

25 candidates passed all papers, without the necessity for compensation; one candidate was awarded a compensated pass (in MS1). Of the total of 26 successful candidates in June, 6 were awarded Distinctions, all with marks of 80% (rounded). This relatively high number of distinctions reflected what the Moderators saw as a strong set of scripts.

The prize for the best overall performance in Prelims was awarded to Frederica Onslow of St Catherine's College. The prize for the best performance in 1st year Practicals was awarded to Josef Hazi, of St Anne's College. Additional prizes for outstanding performance were awarded to Ina Sorensen of Mansfield College, John Waite of St Edmund Hall and Charles Hirst, of Trinity College.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

4 candidates were notified to the Examiners as requiring extra time.

Gender Issues:

Of the 26 candidates 12 were women and 14 men.

2 of the 6 distinctions were awarded to women.

In view of the small overall number of candidates, it is not sensible to draw conclusions from these data. The mean score for males was 71.8 and for females 70.6.

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

All candidates took the same papers for the whole examination.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Attached.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIAL WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Dr P.A.J. Bagot
Dr J.T. Czernuszka (Chairman)
Dr F. Giustino
Dr S. Lozano-Perez

Attachments: Examination Conventions 2011/12
Comments on Materials Science 1: Structure of Materials
Comments on Materials Science 2: Properties of Materials
Comments on Materials Science 3: Transforming Materials
Comments on Maths for Materials and Earth Scientists

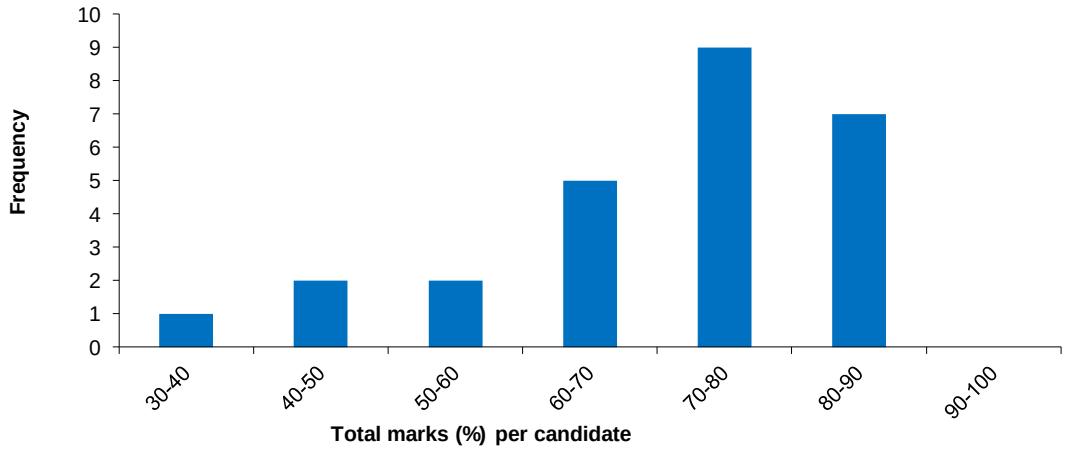
MS1 – Structure of Materials

Examiner: **Dr Sergio Lozano-Perez**
Candidates: **26**
Mean mark: **70.85%**
Maximum mark: **89%**
Minimum mark: **35%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	26	16.00	20	10
2	17	14.59	20	7
3	23	15.26	20	11
4	1	4.00	4	4
5	24	13.46	20	2
6	15	12.13	18	2
7	8	9.13	15	1
8	16	15.31	20	8

Prelims 2011/12
Materials Science 1



General comments:

1. Question 1 was the preferred choice for most students. It mostly required describing and explaining different types of defects in materials and no analytical work was initially needed. Many students failed to identify what a colour centre was and just a few justified the effect of T in diffusion rates in section d) by showing the diffusion rate equation.

2. Question 2 was also quite popular but, unlike Question 1, it required some analytical work, in the form of justifying through ionic radii calculations the expected structure for FeO. Section c), where a description of metallic and ionic bonding was required, was generally fine, but most students lacked a structured answer and they tended to list without any specific order whatever they remembered about the bonds.

3. Question 3 had some similarities with Question 1 and was also quite popular. However, in section b) the calculation of several interstitial volumes was required and this was not generally attempted. The HR rules in section c) were listed and explained correctly by the majority of students. However, most of them forgot to mention that they are negative rules.

4. Question 4 was only attempted by one student, who obtained a very poor mark (4). Its level was somehow higher than the rest of the questions and required a comprehensive understanding of the subject.

5. Question 5 was the most popular choice amongst the 3 Crystallography questions (5, 7 and 8). Out of the three it was the one that required less calculations and had more “essay” writing type questions. It was relatively easy and, still, many students failed to list the Bravais lattices correctly.

6. Question 6 was answered correctly by most of the students who attempted it. They demonstrated a generally good knowledge of the mathematics and formulas required to solve the Schrodinger equation.

7. Question 7 was attempted by 8 students with not much success (average mark of 9 out of 20). It should have been straightforward for any student who had had a go at the list of exercises provided for the Crystallography tutorials.

8. Question 8 was the last of the Crystallography questions and was answered correctly in general. Section d) should have been relatively easy to answer but many students failed to structure it correctly and were much disorganized in their answers and explanations.

Summary:

A general preference for questions who involved explaining and describing as opposed to analytically solving or calculating was observed. For future exams, these two types of questions should be better balanced. Some unusually low marks were found in the Crystallography and Quantum mechanics questions, which indicate a complete lack of knowledge in the area by some of the students.

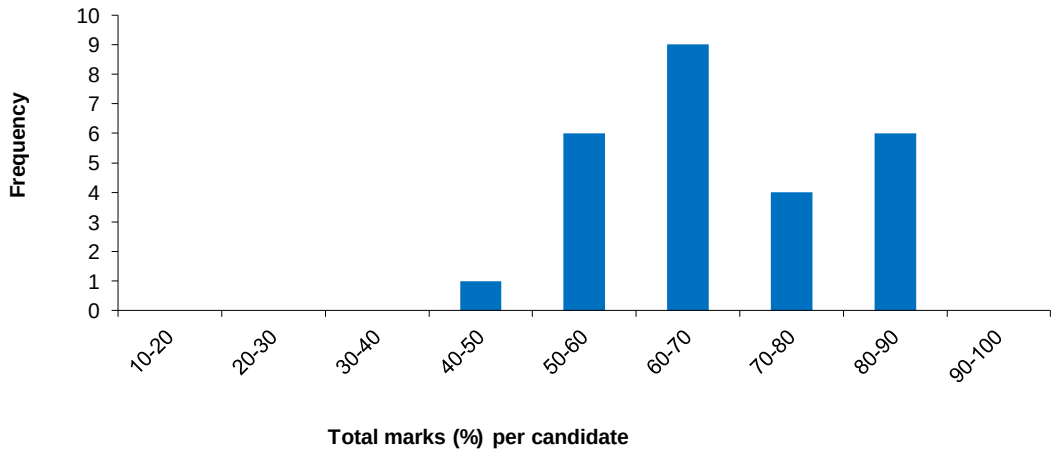
MS2 – Properties of Materials

Examiner(s): **Dr Jan Czernuszka**
Candidates: **26**
Mean mark: **68.77%**
Maximum mark: **90%**
Minimum mark: **45%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	4	14.00	17	7
2	2	11.00	15	7
3	17	15.00	20	6
4	19	12.21	19	4
5	23	13.30	20	3
6	17	13.82	19	7
7	26	15.54	20	9
8	22	12.64	18	6

Prelims 2011/12
Materials Science 2



General Comments

1. **Electrical Circuits** The question requires knowledge and ability to manipulate equations to determine the power and efficiency of a circuit..As in previous years, not many attempts.
2. **Magnetism** A question related to Ampere's Law**.** The least popular question. But well answered by those who attempted it. The question was separated into simple stages.
3. **Kinetic theory of gases** A reasonably popular and straightforward question on deriving several fundamental properties of gases. I.
4. **Mechanical properties** A popular question relating the yield behaviour of BCC single crystals to a particular tensile axis. Generally well answered.
5. **Mechanical properties** A very popular essay based question asking about several factors that control the mechanical properties of ductile materials.
6. **Elasticity** A straightforward question that asked the candidates to derive and draw Bending Moment and Shear Force diagrams. There was an extension of the topic towards a link with the fracture behaviour during 4pt bending of a ceramic.
7. **Elasticity** A question on thin walled pressure vessels and the construction and use of Mohr's circle. The most popular question
8. **Mechanical properties** A question that made the candidate consider aspects of the fundamentals of fracture mechanics, and the Griffith model.

General comment:

The mean mark was relatively high again this year. Even so, there was a spread of results per question. It was pleasing to see so many candidates scoring well – and even obtaining full marks on some questions.

As in previous years, the most common questions were related to the mechanical properties of materials. It seems to me that there could be more cohesion between the topics covered in this paper, and that could help in making for a broader spread in the questions attempted.

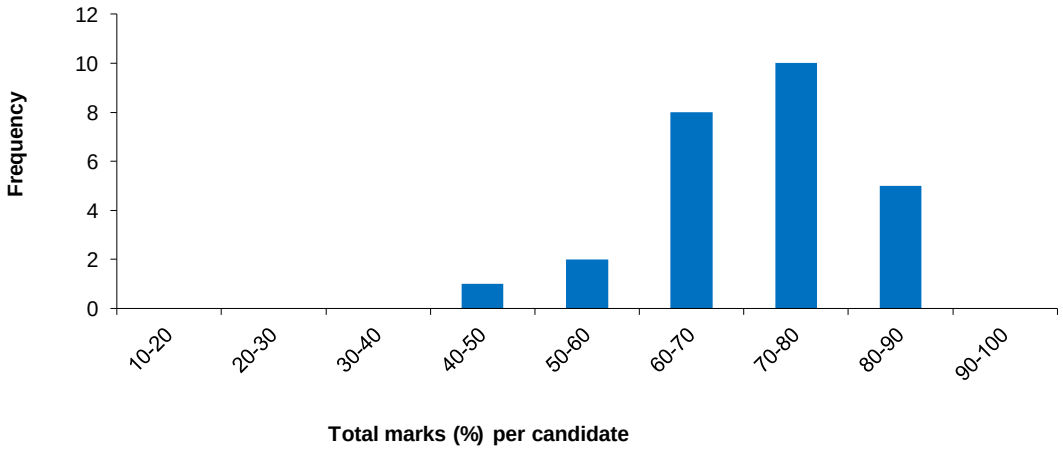
MS3 – Transforming Materials

Examiner(s): **Dr Paul Bagot**
Candidates: **26**
Mean mark: **71.35%**
Maximum mark: **88%**
Minimum mark: **49%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	10	13.80	19	4
2	21	12.48	16	8
3	13	12.31	18	7
4	23	13.39	18	6
5	11	12.91	18	5
6	17	18.41	20	15
7	23	15.26	20	5
8	12	15.08	19	11

Prelims 2011/12
Materials Science 3



Specific Comments

1. **Carnot Cycle** A question concerning the basics of the Carnot cycle. This question had the fewest number of students answering, despite being relatively straightforward and closely matching course notes. The wide range in scores suggests students either understood this fully or else struggled to pick up marks.

2. **Electrochemical cells** This question tested knowledge of how to link electrochemical values with thermodynamic quantities. It was popular with students and had even spread of marks available throughout.

3. **Kinetics of N_2O_5 decomposition** In this question a range of topics from the Kinetics course were tested. Half the students attempted this, which is encouraging as this module only had 3 lectures, and it was reasonably well answered. Some students showed poor graphing skills though which lost simple marks.

4. **Fe-C phase diagram** This question was joint most popular in the MS3 paper, with 88% of students attempting. This material forms a core component for the year, testing a number of key concepts. Most answers reproduced the phase diagram well in part a), and students demonstrated a good understanding of pearlitic steel formation.

5. **Polymers** Only 38% students attempted this, possibly as most of the marks were for an essay-type response. Those who scored poorly in this seemed to have a patchy recollection of the necessary reactions and examples required.

6. **Thermodynamics of enthalpy formations** This question was attempted by 65% of students, however the average mark stood out as being much higher than other questions. The spread of marks was only from 15-20, suggesting it did not sufficiently allow discrimination between students. If students grasped the key concept of summing up the different pathways, there was little else required to obtain high marks, and it was also difficult to deduct any marks from answers. If used in future papers this question should be revised, perhaps by offering only half of the total marks for these types of basic calculations

7. **Nucleation in phase transformations** The joint most popular question, also one with a wide range of marks. The average mark was the second highest at over 15/20, which could be amended in future by shifting marks from part b), where 10 were available for simply recollecting the derivation of equations from the course notes. A further example of using these equations in practice may help such as in part d).

8. **Extrusion mechanisms** This was a relatively straightforward question, requiring an essay-type response of recollecting course work. Surprisingly few students (46%) attempted this considering the nature of the answers required, which again suggests an aversion to essay questions.

General Comments:

The average mark for this paper was rather high, although comparable with other papers in the collection. The distribution of marks is appropriate however, suggesting the paper overall successfully discriminated between students' abilities. Each question had a good attempt percentage from the year, indicating no modules were avoided or require closer attention.

There was an intention in this prelim to shift the overall mark down on previous years by lengthening the questions. In this paper there was little evidence of students being under time-constraints to answer the required number of questions, so future attempts to achieve a suitable average mark should consider tougher final parts and revising questions such as no. 6.

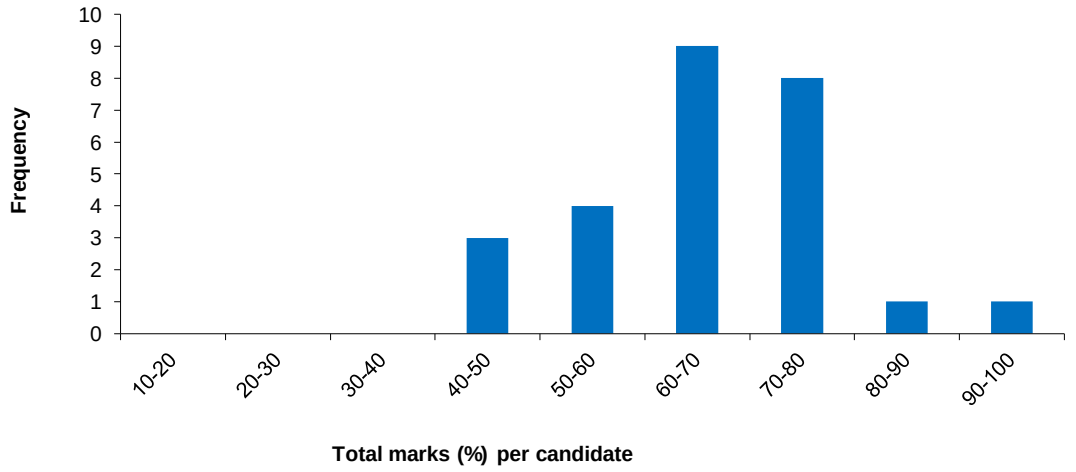
Mathematics for Materials and Earth Sciences

Examiner(s): **Dr Feliciano Giustino**
Candidates: **26**
Mean mark: **66.92%**
Maximum mark: **99%**
Minimum mark: **42%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark
1	26	6.88	8	5
2	26	6.42	8	1
3	26	5.12	8	0
4	26	4.54	8	1
5	26	4.35	8	0
6	26	3.58	8	0
7	26	7.77	8	6
8	26	3.62	8	0
9	26	6.08	8	1
10	26	4.08	8	0
11	13	10.77	22	0
12	24	22.33	25	3
13	8	19.75	25	11
14	19	17.53	25	0
15	12	8.58	25	0
16	26	18.46	25	8

Prelims 2011/12
MMES



General Comments

Candidates were required to answer the short questions 1-10, which cover all the topics taught in the first year course (each question is worth 8 marks).

Description of questions:

Q1: geometry of planes and normal vectors
Q2: combination of linear transformations (matrices) in 3D and inverse
Q3: eigenvalues and eigenvectors of 3x3 matrix
Q4: stationary points of f(x)
Q5: partial derivatives of thermodynamic functions
Q6: indefinite integral
Q7: de Moivre's and binomial theorems
Q8: Taylor expansion
Q9: evaluation of limit
Q10: first-order differential equation

The students were most successful with Q1 and Q7. As far as I understand from discussing with the lecturers these questions reproduce rather closely material from lectures and problem sheets. The indefinite integral in Q6 was not very popular and several students did not realize that a simple variable substitution would simplify the task considerably. Another problematic question was Q8, here several students did not realize that the answer required the combination of two Taylor expansions. My impression is that as soon as a question departs from standard coursework several students struggle in adapting what they have learned to situations that they did not encounter before. On the other hand it should also be stressed that for each question the top mark is 8, therefore at least some of the students were able to provide correct and complete answers.

Candidates were required to answer four of the long questions 11-16 (each question is worth 25 marks).

Description of questions:

Q11: vectors and intersection between a sphere and a plane
Q12: eigenvalues and eigenvectors of a 3x3 matrix, notion of orthogonal matrix
Q13: spherical coordinates and partial derivatives
Q14: moment of inertia of a 2D shape
Q15: definite integrals
Q16: second-order differential equation

The most popular questions were Q16, Q12, and Q14. From my discussion with J. Woodhouse the topics of these questions are discussed in great detail during the course, and this probably explains the popularity. The average marks for these questions are rather high (>17) therefore on average the students performed well in these topics. The popularity of Q12 and Q16 was already observed during previous years.
The least popular question was Q13, although the average mark here is quite high (~20). This question was relatively easy but departed slightly from standard coursework.

Once again my impression is that students tend to prefer questions which do not require much thinking and can be answered by merely applying recipes from standard coursework. If I can make a recommendation I would change the exam paper by introducing one or two questions which require some original thinking – this would allow us to discourage selective preparation to the exam based on papers from the previous years and on tutorial sheets.

It is interesting to note that one candidate answered the entire paper correctly (with only a tiny slip in one question).

Comparison of marks between Materials and Earth Sciences showed that we have been marking papers consistently.

Examination Conventions 2011/12
Common Preliminary Examination
Materials Science and Materials, Economics & Management

The formal procedures determining the conduct of examinations are established and enforced by the University Proctors. These conventions are a guide to the examiners and candidates but the regulations set out in the Examination Regulations have precedence. The examiners are nominated by the Nominating Committee* in the Department and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. In Prelims the examiners are called "moderators". Formally, moderators are independent both of the Department and of those who lecture. The paragraphs below give an indication of the conventions to which the moderators usually adhere, subject to the guidance of other bodies such as the Academic Committee in the Department, the Mathematical, Physical and Life Sciences Division, the EPSC and the Proctors who may offer advice or make recommendations to the moderators.
It must be stressed that to preserve the independence of the Moderators, candidates are not allowed to make contact directly about matters relating to the content or marking of papers. Any communication must be via the Senior Tutor of your college, who will, if he or she deems the matter of importance, contact the Proctors. The Proctors in turn communicate with the Chairman of Prelims.

(1) *Setting of papers*

The Moderators set the papers, but are advised to consult the course lecturers. The course lecturers are required to provide draft questions if so requested by the Moderators. The Prelims paper on Maths for Materials and Earth Sciences is set jointly by the Departments of Earth Sciences and Materials. There are no external examiners for Prelims.

(2) *Paper Format*

The Materials Science papers 1 - 3 comprise eight questions from which candidates must attempt five. Each question is worth 20 marks. The total marks available for each of these papers are 100. The Prelims paper on Maths for Materials and Earth Sciences consists of two sections, candidates are required to answer all questions in Part A and 4 from Part B.

(3) *Marking of papers*

For prelims double marking is not necessarily double "blind" marking. It is usually considered sufficient for the second marker merely to check the first marker's marks.

(4) *Marking of course practicals and crystallography classes*

First year practicals are assessed regularly by senior demonstrators in the teaching laboratory. The work done for crystallography classes is assessed by the Crystallography Class Organiser(s). The assessed work for both practicals and crystallography classes constitutes the Coursework Paper. Each of the five papers in Prelims, comprising the 3 Materials Science papers, Maths for Materials and Earth Sciences, and the Coursework Paper, carry equal total marks. Satisfactory performance in the practical work and in the crystallography classes is defined in the MS/MEM Prelims Handbook. Penalties for late submission of coursework are set out in this handbook.

(5) *Classification*

The pass/fail border is at 40%. Distinctions are usually awarded for average marks of at least 70%. Failure in one or two written papers may be compensated by better performance in other written papers provided the candidate obtains at least 35% on the failed paper. Failure of three papers precludes compensation. Where compensation is permitted, only those marks in excess of 40 on a passed paper may be used towards compensation and normally this shall be at a rate of 3 marks to every deficit mark to be compensated.
For example, if two written papers are passed and marks of 36% and 38% are obtained in the remaining two written papers then the total for the four written papers must be at least 172 marks {36 + 38 + 2x40 + **3**×(4+2)} for both failures to be compensated

The Moderators have the authority to use their discretion and consider each case on its merit.

* for the 2011-12 examinations the Nominating Committee comprised Prof Grovenor, Dr Czernuszka & Dr Taylor.

(6) *Failure of one or more Papers*

Failure of the coursework paper will normally constitute failure of the Preliminary Examination. Materials coursework cannot normally be retaken. Exceptionally a candidate who has failed the coursework may be permitted jointly by the Moderators and the candidate's college to retake the entire academic year.

Candidates who pass the coursework paper and fail 1 or 2 written papers will be asked to resit only those written papers.

Candidates who pass the coursework paper and fail more than 2 written papers will be asked to resit all 4 written papers.

The resits usually take place in September. To pass a resit paper the candidate must obtain at least 40%, and normally no compensation is allowed. There is only one opportunity to resit the examination, and failure to pass a resit examination normally results in the candidate being prevented from continuing to Part I. Exceptionally, a college may allow a student to go down for a year and take Prelims a second time the following June.

The Moderators have the authority to use their discretion and consider each case on its merit. In such cases they will take into account a candidate's profile across all elements of assessment together with, subject to guidance from the Proctors where appropriate, any other factors they deem to be relevant.

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS SCIENCE, PART I EXAMINATION

Part I

A. STATISTICS

(1) **Numbers and percentages in each category**

The Part I Examination in Materials Science is unclassified. No distinctions are awarded.

Category	Number			Percentage		
	2011/12	2010/11	2009/10	2011/12	2010/11	2009/10
Distinction	n/a	n/a	n/a	n/a	n/a	n/a
Pass	28	21	24	97	100	100
Fail	1	0	0	3	0	0

(2) **If vivas are used**
As stated in the Examination Conventions, vivas are no longer used in the Part I examination.

(3) **Marking of scripts**
All scripts were double-blind marked by the Examiners and Assessors. The full procedures are described in the Examination Conventions.

B. NEW EXAMINING METHODS AND PROCEDURES

None this year.

C. CHANGES IN EXAMINING METHODS, PROCEDURES AND CONVENTIONS WHICH THE EXAMINERS WOULD WISH THE FACULTY AND THE DIVISIONAL BOARD TO CONSIDER

Candidates should be given further clarification that one of the requirements to pass the examination is that all practicals must be completed and the write-ups submitted by the stipulated deadline.

D. EXAMINATION CONVENTIONS

The previous year's Examination Conventions were included in the Course Handbook that was distributed to all candidates in hard-copy and was also made available on the Departmental website, to which candidates' attention was drawn by e-mail. The current year's Conventions were put on the Departmental website and sent electronically, along with other information in a letter from the Chair of Examiners to all candidates, on 16 March 2012, and in hard copy for the start of Trinity term. The Examination Conventions were agreed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There were 29 candidates for the examination, and all were awarded Honours, except one who failed to satisfy the examiners. The examination consisted of 6 written papers plus coursework that included a team design project, a business plan, industrial visit reports and practical work carried out during the 2nd year. Two candidates opted to take supplementary subjects. These replaced the business plan. In addition, candidates completed further coursework in the 3rd year in the form of either a module on Materials Characterisation (11 candidates) or one on Materials Modelling (17 candidates). One candidate who withdrew from the Part I Examination last year returned this year to take only the written papers, and was not required to redo the coursework components of the exam.

Each written paper lasted 3 hours. For the General papers, candidates were required to answer 5 questions out of 8, as in previous years. For Options Paper 1, candidates were offered 10 questions in 5 sections each containing 2 questions; candidates were required to answer 4 questions, 1 from each of three sections and 1 from any of the same three sections. For Options Paper 2, candidates were offered 12 questions in 6 sections each containing 2 questions; candidates were required to answer 4 questions, 1 from each of three sections and 1 from any of the same three sections.

Team design projects were marked by two Examiners, one of whom was the Chairman. Teams were marked as groups. The allocation of bonus or penalty marks is permitted under the Conventions, but this was not applied by the examiners this year.

The business plans were marked by an Assessor from Isis Innovation and an Assessor appointed to represent the Faculty of Materials, again with teams being marked as a group.

Candidates' work on the two coursework modules was marked either by 2 Assessors (modelling) or 2 of 3 Assessors (characterisation).

Reports for each of the Industrial Visits were assessed as pass/fail by the Industrial Visits Organiser, appointed as an Assessor.

The overall mean mark for Part I was at the lower end of the 2(i) band. All MS and MEM general papers and option papers results were considered. After extensive deliberation, the examiners scaled paper GP1 by adding 3% points to each candidate's overall mark for that paper. None of the other papers were scaled. GP1, GP2 and GP 4 were in the high 2(ii) band. GP3 was in the middle of the 2(ii) band. OP1 and OP2 were at the lower end of the 2(i) band.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

The performance of the male and female candidates was as follows:
Written Papers Averages – M 63.36% 12.739, F 55.96% 11.07(Overall 59.66%)
Coursework Averages – M 72%, F 70% (Overall 71%)
Overall Part I Averages – M 65.46%, F 59.56% (Overall 62.5%)

Insofar as can be judged from the small sample size, the performance of male and female candidates was not statistically significantly different. This statement is based on the standard deviation of the written paper averages, which was ±12.74% points for the male candidates and ±11.07% points for the female candidates. Both male and female groups of candidates performed better in the coursework than in written examinations.

Where approved by the Proctors, candidates were allowed (i) extra time on account of dyslexia / dyspraxia, and/or (ii) other special arrangements. These allowances seemed satisfactory.

	Overall mark		Written Examinations		Coursework	
mark (%)	Male	Female	Male	Female	Male	Female
30-40	1	-	1	1		-
40–50	-	2	2	2	-	-
50–60	2	6	2	6	1	-
60–70	7	4	5	3	3	6
70–80	5	2	5	2	9	8
80–90	-	-	-	-	2	-
Totals	15	14	15	14	15	14

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

All candidates took the same papers for the whole examination, in that there were no optional written papers.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Detailed comments on the written examination papers and overall candidates' performance on individual questions are attached.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIALS WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

One medical certificate was received and considered for illness during the Materials Options Paper 1, for which allowance was made.

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. M.R. Castell (Chairman)	Dr H.E. Assender
Prof. S.G. Roberts	Prof. T.J. Marrow
Dr K.A.Q. O'Reilly	Dr A.A.R. Watt
Prof. J.G.P. Binner (external)	Prof. W.M. Rainforth (external)

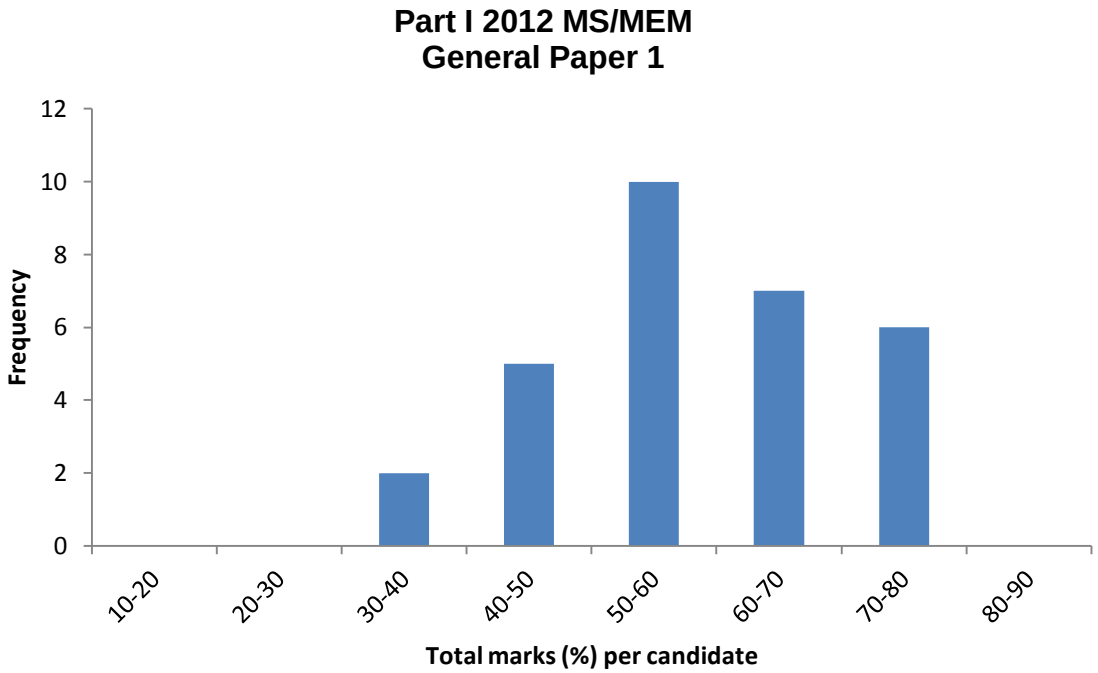
Attachments: Examination Conventions 2011/12 Final Honours School Materials Science
Comments on General Paper 1
Comments on General Paper 2
Comments on General Paper 3
Comments on General Paper 4
Comments on Materials Options Paper 1
Comments on Materials Options Paper 2

General Paper 1 – Structure and Transformations

Examiner: **Prof. James Marrow**
Candidates: **30 (29 MS / 1 MEM)**
Mean mark: **58.77%**
Maximum mark: **80%**
Minimum mark: **39%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	14	13.86	17.5	7	Corrosion
2	16	6.41	8	4	Polymers
3	23	13.33	18.5	5.5	Segregation
4	23	11.33	17	5	Diffusion
5	11	10.14	12	8	Precipitation
6	21	12.48	16.5	6	Nucleation and Growth
7	20	11.38	18	3.5	Ternary phase diagrams
8	21	9.60	15.5	4	Powder processing



General Comments:

Overview: the paper presented a spread of marks slightly lower than the examination guidelines and a mean in the lower second band. The overall spread of attempted answers suggested the paper was well-balanced in terms of subject scope and difficulty, with the exception of question 2. As this might have restricted the question choice for candidates who did not attempt question 2, a degree of scaling was applied.

1. Most produced good answers. The majority missed the following points: the total corrosion current is the sum of the corrosion currents from the reduction of H_2 on Pt and Mn, and although Pt is detrimental to the corrosion of Mn, when coupled, increasing the Pt area further will only increase corrosion rates until the intersection of the Pt Tafel line with the Mn anodic line occurs at E=0V. Beyond this, there is no corrosion.

2. None scored highly. The majority were unable to give a description of liquid crystal phases (nematic, smectic etc) in terms of molecule shape, incorrectly provided descriptions of spherulites; nor were they able to describe the process by which cellular structure would be produced in polystyrene (production of bubbles by volatile gases), providing incorrect descriptions of structures at the molecular level.

3. Most gave satisfactory answers. Common errors were incomplete explanations of the role of grain boundaries, misunderstandings of site competition/co-segregation in terms of precipitates and not atoms and arithmetic errors in the calculation leading to non-realistic answers.

4. Generally good answers except for the derivation of the Matano equation; a few succeeded with this although some presented rather unusual mathematical leaps from Fick's second law to the required equation.

5. All gave reasonable descriptions of the thermodynamic construction for precipitation, but few gave clear descriptions of the thermodynamic driving forces, kinetic limiting processes and assumptions for the expected growth laws; derivations were presented without clear explanation in some cases.

6. Most gave satisfactory answers. Common errors were failure to recognise that the dependence of incubation rate on undercooling was too steep for its use to control grain size in castings, and to give a clear explanation that incubation time is due to the distribution of clusters formed at high temperature needing to grow.

7. Done to a fair standard, through the accuracy of plotting of the phase diagram was generally poor. This caused problems with the final part of the question for the majority, who failed to spot that the composition in b(ii) was below the liquidus inflexion, so no peritectic reaction occurs.

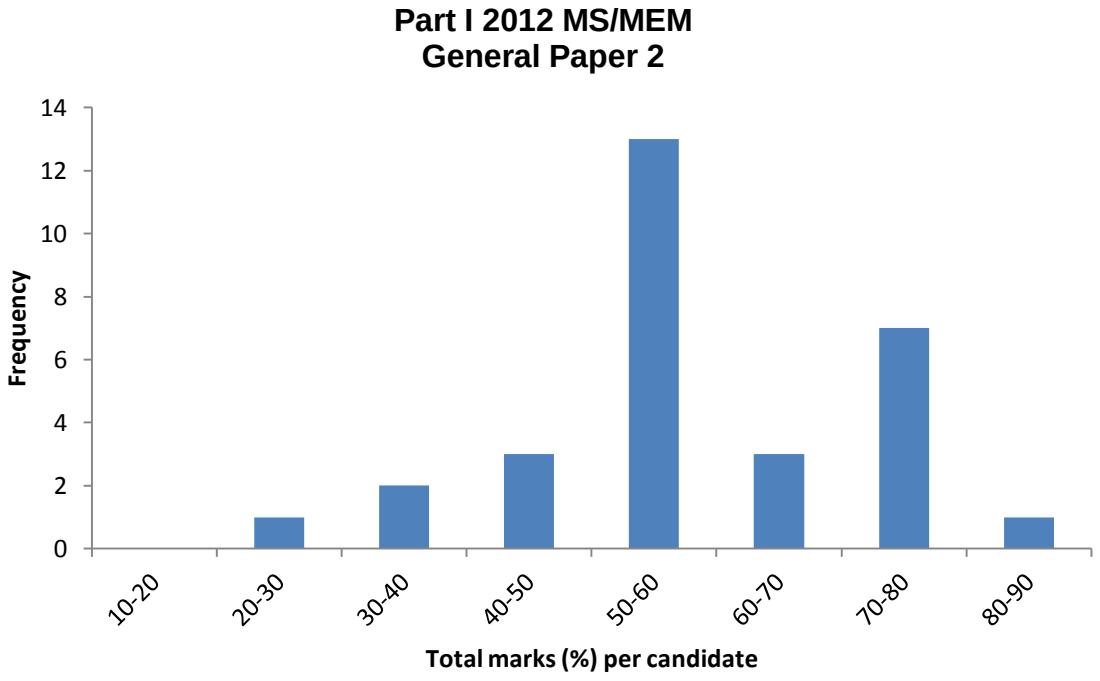
8. Most produced satisfactory answers, though the majority failed to provide sufficient information to demonstrate that they understood the main reasons for use of powder production for the particular applications.

General Paper 2 – Electronic Properties of Materials

Examiner: **Prof. Martin Castell**
Candidates: **30 (29 MS / 1 MEM)**
Mean mark: **59.27%**
Maximum mark: **90%**
Minimum mark: **27%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	24	13.60	19	10	Magnetic Properties of Materials
2	25	12.44	19	4	Statistical Mechanics
3	25	9.16	17	1	Quantum Mechanics
4	23	13.30	18.5	5.5	Tensor Properties
5	7	10.71	18	4	Electronic Structure
6	14	12.11	18.5	4.5	Electronic Structure
7	12	9.50	14	5	Electronic Properties of Materials
8	19	12.50	19	4	Semiconductors



General Comments:

The average for this paper was slightly lower than one might have hoped, but there was a broad range of marks, indicating that the more capable students were able to distinguish themselves. There was evidence of rote learning of derivations, such as in the travelling wave question (Q3), but with complicated derivations of this nature it was apparent that it is easy to come unstuck, resulting in poor marks. Oddly, the much simpler derivation of the ferroelectric catastrophe theory (Q8) was not tackled successfully by many students.

Question 1 on Magnetic Properties of materials was very popular and generally achieved high marks. The question was straightforward, with the possible exception of the last part which students tended either to answer correctly and achieve near full points, or not answer and achieve low points.

Question 2 on Statistical Mechanics was very popular and achieved high marks for most of the students who answered it. Surprisingly, some students had difficulty with the definition of a microstate. There were also some isolated difficulties with the calculation of probabilities.

Question 3 on wave mechanics was very popular, presumably because it was similar to worked examples in the lectures and tutorial problem sheet. However, from part b onwards the answers were almost all poor with many students demonstrating a lack of ability to deal with the solutions of travelling wave equations.

Question 4 on tensor properties of materials was popular and in the mean the marks were high. Parts a and b were mainly bookwork, but the calculation in part c required some thinking, which is where some of the students had difficulty.

Question 5 on the ionised hydrogen molecule was not popular. The mathematical nature of the question may have put some students off, though there was little maths to do in the actual solution. The results were highly bimodal in that the students received either high or low marks, but little in between.

Question 6 on electron band structure was below average popularity, possibly because the question was quite long. Some answers were very poor, demonstrating a poor understanding of the subject, but generally the students who attempted this question did relatively well.

Question 7 was a straightforward problem on pyroelectric and ferroelectric materials. It was not particularly popular and scored poorly. The greatest difficulty that students experienced was the mathematical description of the ferroelectric catastrophe theory in 1D, which is however standard tutorial work.

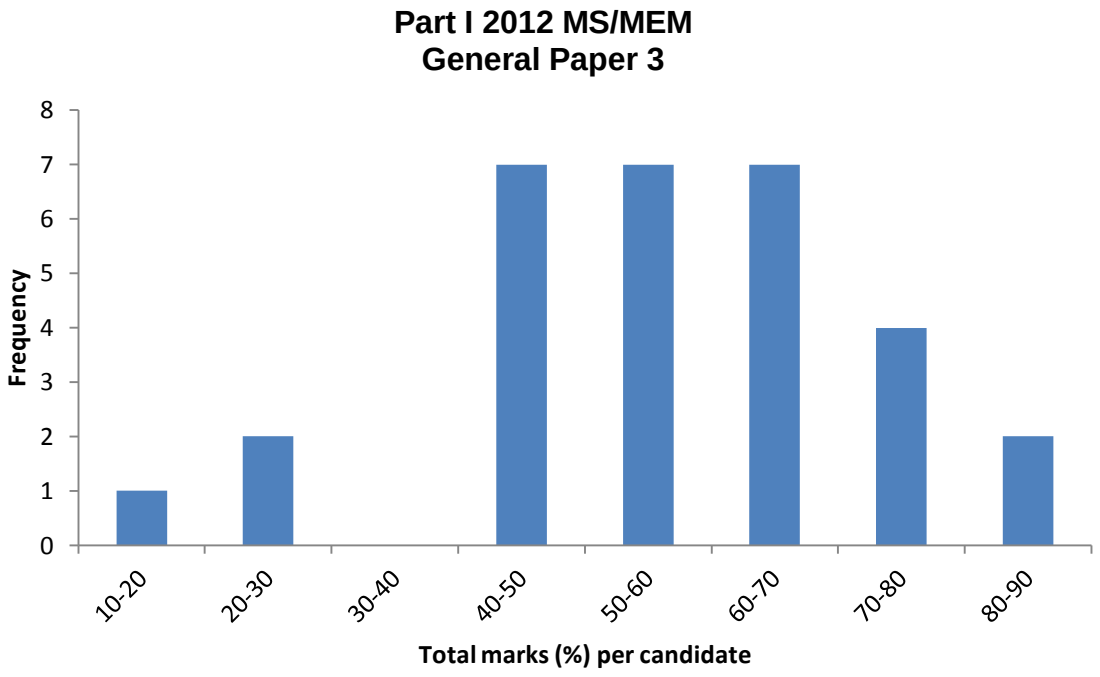
Question 8 on metal-semiconductor contacts was of average popularity. The answers were generally good with the exception of part c where most students were unable to answer the section completely.

General Paper 3 – Mechanical Properties

Examiner: **Prof. Steve Roberts**
Candidates: **30 (29 MS / 1 MEM)**
Mean mark: **56.77%**
Maximum mark: **83%**
Minimum mark: **18%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	8	8.75	18	3	Macroplasticity: yield criteria
2	28	12.25	16	5	Microplasticity: hardening.
3	15	12.53	18	6	Microplasticity, dislocations
4	24	11.46	19	4	Polymers: viscoelasticity
5	23	11.96	20	3	Isotropic elasticity
6	20	10.40	17	3	Fracture
7	10	8.50	11	5	Fatigue
8	19	13.63	19	3	Composites: toughness



General Comments

Overall, a rather disappointing set of answers. However, enough candidates scored well overall, and on all but one question, to reinforce the examiners' view that the standard of questions set was appropriate and fair. What was particularly disappointing was that very often the marks were lost in the first parts of the questions, which were aimed at establishing that those answering the question knew and understood at least the basic concepts involved, before proceeding to some more advanced ideas. Marks were often gained in "derivations" or similar things that could be rote-learnt.

1. Macroplasticity: yield criteria, torque. Only one candidate and understood the concepts in this question well enough to make a coherent attempt. All others managed the first "book work" sections by rote with varying degrees of success, and then collapsed.

2. Microplasticity: hardening mechanisms. Although a very popular question, this was not particularly well done by the majority of those attempting it. Most candidates were not clear what a "mechanism" is, and were generally vague about the concepts in the question. Rote answers to the "derivation" in section b, without much explanation, were very common. In section a there was very often confusion between the roles of solutes atoms and precipitates. There was also very often confusion between the concepts of force, stress, and energy.

3. Microplasticity, dislocation mechanics. There were easy marks to be got in this question for part d – which really needed no knowledge of dislocations at all. Even so, a few got nowhere with it. Various degrees of understanding were shown in sections a to c, from almost none, to very sound.

4. Polymers: viscoelastic behaviour. In retrospect, perhaps this question was too easy in sections a to c, for the marks given. Section d caused problems; few could actually derive the expression, though some had memorised the final result.

5. Isotropic elasticity. The "book work" stuff in section 8 was generally done well. In the problem that followed, students often had great difficulty in identifying boundary conditions – often looking at the rigid fibre (for example at r=0) rather than the metal that the question was actually about. Only one candidate could properly use, and only four attempted to use, a simple yield criterion in section c.

6. Fracture. Only one decent answer to this question. Most candidates were vague about basic ideas here, some fairly vague indeed.

7. Fatigue. Badly, or very badly, done by the few who attempted it. Candidates had difficulty with identifying the relevant parts of the graph, with units, with criteria for safety, and with working through the integral in b.iii.

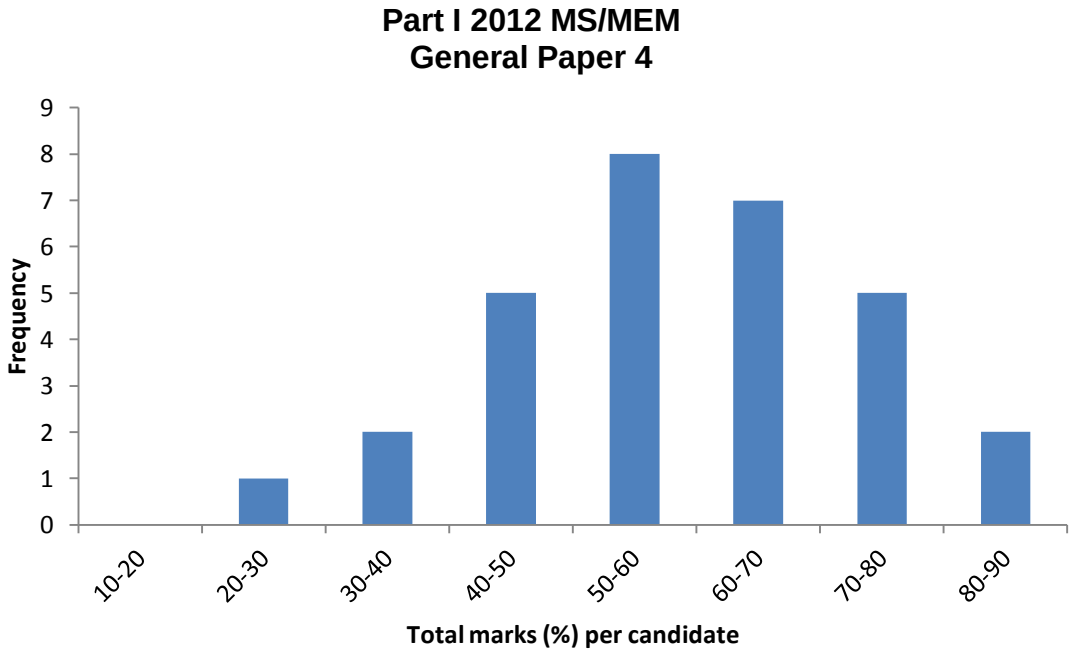
8. Composites: toughness. Many candidates appeared not to know what "toughness" actually is – so calculated rule-of-mixtures stresses or similar in part b. Many attempts at a.ii were unconvincing, with little or no explanation, and the maths fudged to get the result given in the question.

General Paper 4 – Engineering Applications of Materials

Examiner: **Dr Hazel Assender**
Candidates: **30 (29 MS / 1 MEM)**
Mean mark: **59.07%**
Maximum mark: **84%**
Minimum mark: **25%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	16	9.88	15	3	Polymers
2	15	11.40	18	5	Microstructural Characterisation
3	25	13.40	19	4	Microstructural Characterisation
4	20	12.10	18	5	Engineering Alloys
5	23	11.09	18	6	Engineering Alloys
6	13	14.23	18	6	Semiconductor Devices
7	17	11.88	19	3	Ceramics and Glasses
8	21	10.67	16	4	Ceramics and Glasses



General Comments

The mean mark for the paper came in under 60%, and there was a large spread in the marks. All questions had a consistently low lowest mark, but there were also excellent marks in many questions.

Question 1: *Extrusion of polymers.* Although answered by a good number of students, this question resulted in the lowest mean mark. (a) There was confusion shown by some candidates between extrusion and drawing. (bi) The least well answered section of the question, with some confusion over thermodynamics, and few candidates mentioned the effect of viscosity. (bii) Many candidates described general alignment rather than the high alignment that would produce high stiffness materials.

Question 2: *EDX*. The less popular of the two questions on this course. (a) Generally well answered basic start to the question, though some candidates confused electron promotion and electron removal. (b) Often no mention of the photoelectron or how the e/h pairs in the detector are collected. (c) The most poorly answered section of the question: many candidates considered the effect e.g. of removing background intensity rather than sample-dependant corrections. (d) Most candidates could determine the Cliff-Lorimer factor for Cu-Mn, but then often could not translate this into a composition.

Question 3: *Electron diffraction*. The most popular question, attracting a high mean mark. (a) Some candidates neglected the 'smearing' effect on the diffraction spots due to a thin sample. (b) Very well answered section with some errors in forming the cross-product. (c) Some candidates relied on overall symmetry rather than systematic absences. (d) The weakest part of the question: some confusion between θ and 2θ, and some did not get the relationship between a and d. (e) Many candidates got zero on this section, but those that attempted the calculation generally did it correctly.

Question 4: *Ni superalloys*. (a) A well-answered section of the question, with most candidates only dropping a couple of marks e.g. for wrong reasoning for the microstructure or poor reasoning for some alloying elements. (b) A greater spread of marks in this section. Many candidates did not discuss carbides and were weak on the changes in composition.

Question 5: *Mg alloys*. (a) Good answers, although some candidates did not mention the implication of the hcp structure. (b) Many candidates did not identify the correct alloy components, and several did not mention precipitation and quench/age. (c) Poorly answered section: few candidates mentioned gb pinning. (d) Poorly answered section: generally vague answers not specific to cast and sheet products.

Question 6: *Silicon bipolar transistors*. The least popular question, but one that attracted the highest mean mark. (a) A well-answered section, although some candidates lost marks on discussion of the differential voltages and the narrow base layer. (b) Dopant levels were sometimes quoted in the wrong order, which lead to incorrect reasons being given for their levels. The graded base explanations were often poor. (c) Generally candidates made a reasonable attempt at this section with slightly weak explanations.

Question 7: *Glasses and glass ceramics*. (a) The weakest section of the question with some very poor answers showing a lack of understanding of the nature of T_g and crystallization. (b) Generally well answered; some candidates did not give examples, and most marks were lost on network modifiers. (c) Several candidates described the wrong class of material: either liquid phase sintering or glasses. (d) A well-answered section.

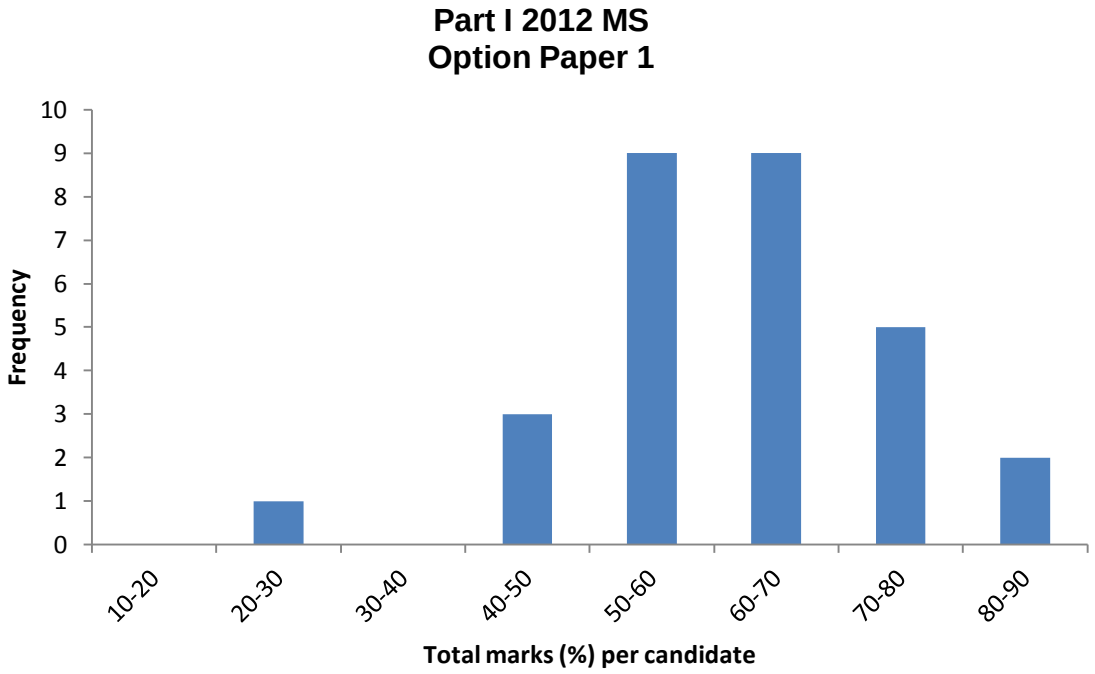
Question 8: *Porosity in ceramics*. A low average mark for this question. (a) Candidates often could not give a range of origins for porosity. (b) The weakest section: many candidates did not know the specific cases given in the question and gave general 'sintering' answers. (c) Strong answers to this section, though some candidates gave a general description of sintering rather than relating their answers strongly to the microstructures given.

Materials Options Paper 1

Examiner: **Dr Andrew Watt**
Candidates: **29 (MS)**
Mean mark: **62.24%**
Maximum mark: **84%**
Minimum mark: **30%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	14	13.79	19	6	Strength and failure of materials
2	17	13.76	21	5	Strength and failure of materials
3	18	19.58	24	8	Nanomaterials
4	8	14.44	20.5	5	Nanomaterials
5	2	18.00	22	14	Prediction of materials properties
6	1	13.00	13	13	Prediction of materials properties
7	11	19.73	23	17	Materials and devices for optics and optoelectronics
8	6	13.83	17	11	Materials and devices for optics and optoelectronics
9	12	13.50	23	6	Engineering ceramics: synthesis and properties
10	24	15.10	22	3.5	Engineering ceramics: synthesis and properties



General Comments

Overview: The mean mark of the paper was 62.24%, which was close to the target mid 2.1 range. There was a good spread of results across the board with equal weighting in the 2.2 and 2.1 bands decreasing either side, indicating that the exam was very good at distinguishing between the candidates' abilities and suggesting that the level of difficulty appropriate. Only one candidate consistently struggled through the paper and brought down the mean mark..

1. A popular question on damage tolerance design of structural components. Majority of answers were average and few candidates excelled.

2. A question on alloys, similarly answered to question 1, again candidates struggled to excel and struggled in parts (c) and (d) in particular.

3. The second most popular question in the paper on properties of nanoparticles and applications which included am easy calculation. Very high average mark suggesting the question was too easy.

4. Eight candidates choose this question, considerably more than previous years, 1 (2010) and 0 (2011). This year the question was less mathematically rigorous in comparison to previous years, it required the discussion of nanoparticle size and metal temperature and carrier mean free path alongside a calculation involving a single atomic conductor.

5. A question on the derivation of phonon dispersion relations. Only two candidates answered this question but both good answers.

6. A question on phonon dispersion relations measured by inelastic X-ray scattering and the most unpopular question in the exam, with only one answer. As with question 4 and 5 this course appears to discourage students due to the strong mathematical foundation

7. A very well answered question on lasers, balanced with equal book work and calculations required, calculations on the easy side.

8. Not at as well answered as 7 on AR coatings and optical switching, marks still reasonable with no very poor performances. A little confusion in part (e) on question meaning as the in the lectures part (i) and (ii) had been taught in a complete system.

9. Less popular question on ceramics synthesis with a wide range of marks.

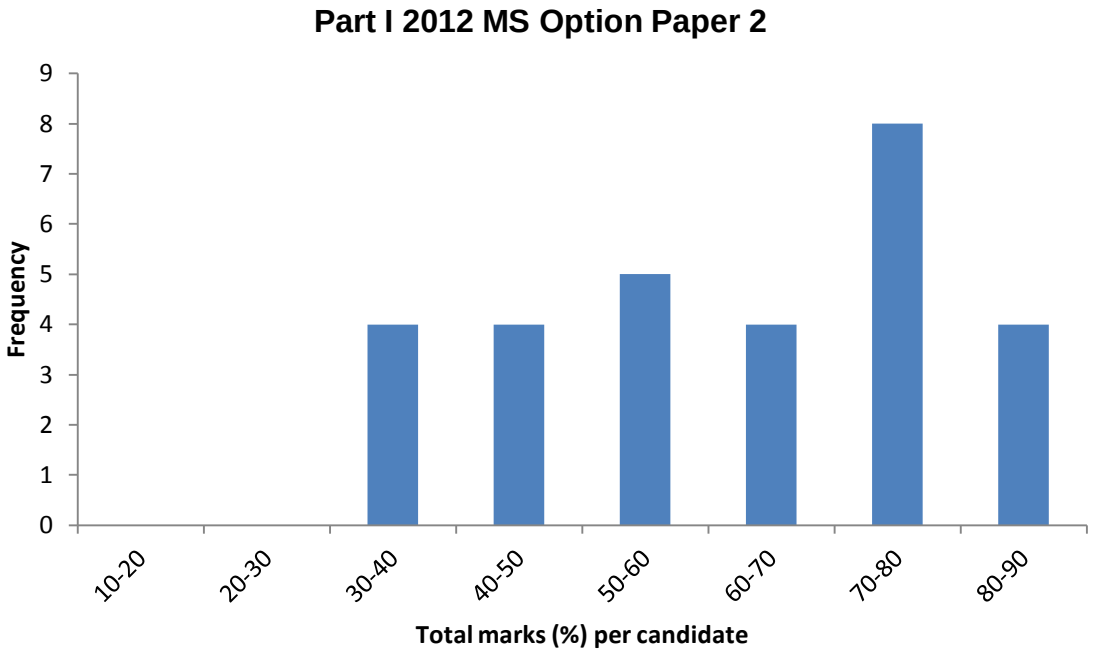
10. The most popular question in the paper on heat treatment of ceramics and crack propagation. Average of a low 2.1 and fairly representative of previous years performances in a similar question.

Materials Options Paper 2

Examiner: **Dr Keyna O'Reilly**
Candidates: **29 (MS)**
Mean mark: **61.97%**
Maximum mark: **82%**
Minimum mark: **35%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	8	18.19	24.5	11.5	Polymer crystallisation
2	9	18.61	23	11.5	Phase instability in polymers
3	15	16.60	21	12.5	Cast irons
4	8	14.75	19.5	10	Defects in welds & shape-castings
5	9	14.89	22	5	Energy storage & heat exchangers
6	4	11.63	16	8	Future power generator materials
7	9	17.50	20	13	Advanced composites
8	6	10.33	21	5	Materials for high T applications
9	20	17.55	22	12	Natural materials
10	19	16.74	23	9	Materials for hip replacements
11	4	17.75	22	12.5	Devices
12	13	12.92	22	3.5	Partially stabilized zirconia



General Comments

Generally the paper was well done, with a particularly high average mark for the 4th year MEM candidates.

Specific Comments

ADVANCED POLYMERS

Question 1. Polymer crystallisation.

Not a very popular question. Candidates generally did not provide full answers in the context of materials properties and in cases demonstrated a lack of understanding of the relationship between the glass transition temperature and the polymer's ability to crystallize. Not all candidates got the correct axes for the Guinier plot. For the numerical sections, most candidates had the correct approach, but several made sloppy mistakes and used incorrect units.

Question 2. Phase instability in polymers.

Again, not a very popular question. Few candidates could provide a clear description of the dependency of the phase behaviour on molecular weight. Part (b) was generally well answered. In part (c) some candidates didn't justify the criterion applied, and some applied the wrong criterion.

ADVANCED MANUFACTURE WITH METALS AND ALLOYS

Question 3. Cast irons.

A popular question on cast irons. Several candidates gave clear and detailed explanations of the mechanisms involved, though a number of candidates did not clearly separate the mechanisms which affected nucleation from those that affected growth. The section on surface treatment was generally not very well done, with very few answers to the section on vitreous enamelling. Most candidates could say something about the post-casting processing of white cast irons to produce white-heart and black-heart iron, but generally lacked detail regarding the specific conditions, microstructures and properties.

Question 4. Defects in welds & shape-castings.

A reasonably unpopular question on defects in welding and shape-casting. Most candidates made a reasonable attempt at describing how shrinkage and gas porosity arise, but many did less well at drawing out the similarities and differences between the defect formation in the two processes. A significant number of candidates did seem to know what residual stresses are. Candidates were generally weaker at describing the approaches to defect minimisation in arc welding than in conventional sand casting, and similarly, they knew more about the Cosworth casting process than friction stir welding.

MATERIALS FOR ENERGY PRODUCTION< DISTRIBUTION AND STORAGE

Question 5. Energy storage & heat exchangers.

A reasonably popular question on energy storage and heat exchangers. In (a), candidates often confined their answers only to the balancing of energy demand across a day. In (b) many candidates answered as for a general capacitor, giving an incorrect diagram and saying little about their properties. There were some good answers to the comparison with conventional rechargeable batteries, though some candidates failed to attempt this part of the question. In part (c), a few candidates were only able to outline the approach, but most gave good answers. Not all candidates attempted the final calculation.

Question 6. Future power generator materials.

An unpopular question on materials for future power generating plant. Generally the level of detail was less than expected regarding the principles of operation of the reactors as opposed to the physics of the processes. There was a lack of specific detail given regarding the materials chosen for the various components.

ADVANCED ENGINEERING ALLOYS AND COMPOSITES

Question 7. Advanced composites.

A reasonably popular question on advanced composite materials. Generally, candidates lacked a knowledge of specific details when discussion the structure, and particularly the properties, of GLARE composites. In the section covering the processing of titanium matrix composites, most candidates had a general idea of the processes involved, but again lacked specific details and provided answers more at the level that would be expected in a General Paper. Few candidates could give specific examples of industrial applications, most only being able to say “aerospace”.

Question 8. Materials for high temperature applications.

An unpopular question on materials for high temperature applications. All three parts of the question lacked specific details relevant to the particular materials being asked about in the question. General answers about martensite, steels and microscopy techniques. On a level you might expect from the General Paper Engineering Alloys course. Part (a) in particular lacked an appreciation of the fact that the material being creep resistant would have an impact on its likely applications. No candidate discussed the strengthening mechanisms involved and no candidate gave any compositions.

BIOMATERIALS AND NATURAL MATERIALS

Question 9. Natural materials.

The most popular question on the paper. Candidates were generally weakest at describing the chemical nature of phospholipids and the conformation of polysaccharides. Candidates were also rather weak at describing why hierarchy arises. When discussing applications in tissue engineering, candidates were generally weak in describing cell anchoring and degradation products.

Question 10. Materials for hip replacements.

Another very popular question on total hip replacements. There was little comment as to alternatives for total hip replacements, and a few candidates didn’t discuss osteoporosis at all. When discussing the components of a total hip replacement, some candidates missed out one of the components entirely. Some candidates did not discuss the possibility of stem/ball failure and some had little on polymer wear.

DEVICES, MEMORY AND STORAGE

Question 11. Devices.

Generally a reasonably well answered but rather unpopular question. Weaker candidates struggled with the second part of (b), and a number of candidates missed the point that a material with a higher permittivity was required in the third part of (b).

Question 12. Partially stabilized zirconia.

A popular and straightforward question on PZT. There were several very good answers where the candidates had clearly understood the material and could put it into their own words. The phase diagram for PZT was the least well remembered part. A number of candidates scored less that 10 marks, and clearly knew rather little about the topic.

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS SCIENCE, PART II EXAMINATION

Part I

A. STATISTICS

(1) **Numbers and percentages in each category**

Candidates are given a mark on the basis of their performance in the Part II examination and then given a classification on the basis of their performance across Part I and Part II.

Class	Number			Percentage (%)		
	2011/12	2010/11	2009/10	2011/12	2010/11	2009/10
I	7	9	6	31.8	39.1	26.1
II.I	11	8	14	50.0	34.8	61.9
II.II	2	6	3	9.1	26.1	13.0
III	2	0	0	9.1	0	0
Pass	0	0	0	0	0	0
Fail	0	0	0	0	0	0
Total	22	23	23	-	-	-

(2) **The use of vivas**
The Part II examination in Materials Science consists only of a research project, for which a thesis not exceeding 12,000 words, or 100 pages, is produced. Each thesis was read by two internal examiners and one external and the final thesis mark was then agreed. All candidates were given a viva but numerical marks are not given for viva performance. The viva was used to clarify points of detail and to ensure that the thesis presented has been prepared by the candidate being examined.

(3) **Marking of theses**
All theses were double blind marked by two internal examiners, and read by one external examiner. (Due to the small number of candidates, which makes it easy to identify who is working on a particular research topic, anonymous marking is not possible.) Provisional marks were exchanged in advance of the viva, to allow a brief discussion of differences of assessment, which if necessary could be explored further during the viva. Following the viva, a final agreed mark was decided between all the examiners. The two internal examiners who read the thesis and the external examiner provided the greatest input into the decision making process.

B. NEW EXAMINING METHODS AND PROCEDURES

1. The word limit for the Part II thesis was set at to 12,000 words (from 15,000 previously), and the page maximum was set at 100 pages (from 120 previously).

2. Following a recommendation from the external examiners, the examination conventions were changed to clarify the influence that the viva has on the Part II mark. The conventions now read:

"A *viva voce* examination is held: the purpose of the viva is to clarify any points the readers believe should be explored, and to ascertain the extent to which the work reported is the candidate's. An examiners' discussion is held after the viva, involving all Part II examiners, and at which time Part B of the supervisor's report is taken into account. The outcome of the discussion is an agreed mark for the project. In arriving at the agreed mark the Examiners will take into account all of the following, (i) the opinion of the external examiner who has read the thesis, (ii) the candidate's understanding of their work as demonstrated during the viva and (iii) the comments and provisional marks of the original markers. It is stressed that it is the scientific content of the project and the candidate's understanding of their work that is being considered in the viva.
If the two provisional marks allocated in advance of the viva differ significantly (that is, normally by more than 10% of the total available for the project) this will be addressed explicitly during the discussion after the viva. In the majority of other cases the viva has only a small influence on the agreed mark awarded to a Part II thesis."

Prior to the change the conventions read:

"A *viva voce* examination is held: the purpose of the viva is to clarify any points the readers believe should be explored, and to ascertain the extent to which the work reported is the candidate's. An examiners' discussion is held after the viva, involving all Part II examiners, and at which time Part B of the supervisor's report is taken into account. The outcome of the discussion is an agreed mark for the project. It is stressed that it is the scientific content of the project that is being considered in the viva. In the overwhelming majority of cases, the viva has only a small influence on the agreed mark awarded to a Part II thesis."

C. CHANGES IN EXAMINING METHODS, PROCEDURES AND CONVENTIONS WHICH THE EXAMINERS WOULD WISH THE FACULTY AND THE DIVISIONAL BOARD TO CONSIDER

Towards the beginning of Trinity Term, the Part II candidates are invited to give a talk on their research to the whole department. This talk is not examined and does not contribute in any way to the evaluation of the Part II thesis. Part II Examiners may only attend the talks of Part II students that they have supervised. This rule is in place so that Examiners cannot be influenced by the quality of the talk in their evaluation of the Part II thesis. For administrative reasons, the Part II Project Organiser is required to attend all Part II talks. This presents a conflict of interest if the Part II Project Organiser is also an Examiner, as was the case this year. The Part II Project Organiser declared this conflict of interest to the Chairman of Examiners and the Director of Studies prior to attending the talks. It is difficult to know what more steps should be taken other than to formally acknowledge that this conflict of interest can arise and should be declared at the earliest opportunity.

D. EXAMINATION CONVENTIONS

The previous year's Examination Conventions were included in the Course Handbook that was distributed to all candidates in hard-copy and was also made available on the Departmental website, to which candidates' attention was drawn by e-mail. The current year's Conventions (2012, attached) were put on the Departmental website and sent electronically to all candidates on 16 March 2012, and in hard-copy for the start of Trinity term. The Examination Conventions were assessed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There were 22 candidates for the examination, who were all awarded Honours. The examination required the candidates to submit a thesis (maximum 12,000 words) on a research project carried out by candidates during the year, usually in the Department of Materials. Two candidates did external projects, both at MIT in the USA. Candidates were given a 25 minute viva, during which they were asked detailed questions on their thesis and research work.

The theses were generally of a very high quality, and the candidates were able to explain their work well in the vivas. As usual, in some cases the vivas became short but in-depth scientific discussions with the candidates. The marks for the Part II examination ranged from 40% to 80%, with an overall mean mark almost in the middle of the 2(i) range. The external Examiners played an important role in deciding the final marks for the candidates, and the Chairman would like to express his thanks to both of them for their hard work in reading so many Part II theses and contributing greatly to the vivas.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

Insofar as can be judged from the small sample size, the performance of male and female candidates was not significantly different.

If necessary, where approved by the Proctors, the Examiners took into account the impact of dyslexia and other specific learning difficulties and/or other special arrangements. These allowances seemed satisfactory.

	Overall mark		Part 2 Project		Part I Mark	
mark (%)	Male	Female	Male	Female	Male	Female
40–50	1	1	1	-	1	1
50–60	1	2	-	3	1	2
60–70	7	3	7	3	7	4
70–80	2	5	2	5	2	4
80–90	-	-	1	-	-	-
Totals	11	11	11	11	11	11

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

All candidates took the same examination, producing a thesis and attending a viva. The statistics on the final marks for both Part I (2011) and Part II for these candidates is given above.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Not relevant for this examination.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIALS WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

One candidate was granted an extension of 5 days by the Proctors on the basis of medical reasons.

[redacted]

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

Prof. M.R. Castell (Chairman)	Dr H.E. Assender
Prof. S.G. Roberts	Prof. T.J. Marrow
Dr K.A.Q. O'Reilly	Dr A.A.R. Watt
Prof. J.G.P. Binner (external)	Prof. W.M. Rainforth (external)

Examination Conventions 2011/12
Final Honours School
Materials Science

1. INTRODUCTION

The formal procedures determining the conduct of examinations are established and enforced by the University Proctors. These conventions are a guide to the examiners and candidates but the regulations set out in the Examination Regulations have precedence. The examiners are nominated by the Nominating Committee* in the Department and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. Formally, examiners are independent of the Department and of those who lecture courses. However, for written papers on Materials Science in Part I examiners are expected to consult with course lecturers in the process of setting questions. The paragraphs below indicate the conventions to which the examiners usually adhere, subject to the guidance of the appointed external examiners, and other bodies such as the Academic Committee in the Department, the Mathematical, Physical and Life Sciences Division, the Education Committee of the University and the Proctors who may offer advice or make recommendations to examiners. It must be stressed that to preserve the independence of the examiners, candidates are not allowed to make contact directly about matters relating to the content or marking of papers. Any communication must be via the Senior Tutor of your college, who will, if he or she deems the matter of importance, contact the Proctors. The Proctors in turn communicate with the Chairman of Examiners.

During the marking process the scripts of all written papers remain anonymous to the markers.
[In some of the descriptions of marking for individual elements of coursework that are given later in this document the term 'double marked, blind,' is used; this refers to the fact that the second marker does not see the marks awarded by the first marker until he or she has recorded his or her own assessment, and does not indicate that the candidate is anonymous to the markers.]

Marking criteria for the Business Plan, Team Design Project and Part II project are published in the relevant course handbook.

Late Submission of or Failure to Submit Coursework
The Examination Regulations stipulate specific dates for submission of the required pieces of coursework to the Examiners (1. One piece of Engineering & Society Coursework; 2. A set of detailed reports of practical work; 3. A Team Design Project Report; 4. Industrial Visit Reports as specified in the course handbook; 5. A report on the work carried out in either the Characterisation of Materials module or the Introduction to Modelling in Materials module; and 6. A Part II Thesis). Rules governing late submission and any consequent penalties are set out in the 'Late submission of work' sub-section of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations (pp46-47 of the 2011 Regulations).

Under the provisions permitted by the regulation, late submission of coursework for Materials Science or Materials, Economics & Management examinations will normally result in the following penalties:

(a) With permission from the Proctors under clause (1) of para 16.8 no penalty.
(b) With permission from the Proctors under clauses (3) + (4) of para 16.8, for the first day or part of the first day that the work is late a penalty of a reduction in the mark for the coursework in question of up to 10% of the maximum mark available for the piece of work, and for each subsequent day or part of a day that the work is late a further penalty of up to 5% of the maximum mark available for the piece of work; the exact penalty to be set by the Examiners with due consideration given to any advice given in the Proctors' "Notes for the Guidance of Examiners and Chairmen of Examiners".
(c) Where the candidate is not permitted by the Proctors to remain in the examination he or she will be deemed to have failed the examination as a whole.

Where no work is submitted or it is proffered so late that it would be impractical to accept it for assessment the Proctors may, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Examiners, permit the candidate to remain in the examination. In this case the Examiners will award a mark of zero for the piece of coursework in question.

Penalties for late submission of individual practical reports are set out in the MS/MEM FHS Handbook and are separate to the provisions described above.

* for the 2011-12 examinations the Nominating Committee comprised Dr Czernuszka, Prof Grovenor & Dr Taylor.

2. PART I

(1) *Setting of papers*

Part I General Papers 1 – 4 are set by the examiners in consultation with course lecturers. The responsibility for the setting of each examination paper is assigned to an examiner, and a second examiner is assigned as a checker. Option papers are set by lecturers of the option courses and two examiners, the examiners acting as checkers. The examiners, in consultation with lecturers, produce model answers for every question set. The wording and content of all examination questions set, and the model answers, are scrutinised by all examiners, including, in particular, the external examiners.

(2) *Paper Format*

All General papers comprise eight questions from which candidates attempt five. Each question is worth 20 marks. The total number of marks available on each general paper is 100. Materials Option papers comprise one section for each twelve-hour Options lecture course, each section containing two questions: candidates are required to answer one question from each of any three sections and a fourth question drawn from any one of the same three sections. The total number of marks available on each option paper is 100, and all questions carry equal marks. Questions are often divided into parts, with the marks for each part indicated on the question paper.

(3) *Marking of papers*

All scripts are double marked, blind, by the setter and the checker. After individual marking the two examiners meet to agree marks question by question. If the differences in marks are small (~10% of the total available for the question, 2-3 marks for most questions), the two marks are averaged, with no rounding applied. Otherwise the examiners identify the discrepancy and read the answer again, either in whole or in part, to reconcile the differences. If after this process the examiners still cannot agree, they seek the help of the Chairman, or another examiner as appropriate, to adjudicate. An integer total mark for each paper is awarded, where necessary rounding up to achieve this.
Options papers are marked by course lecturers acting as assessors and an examiner acting as a checker. The external examiners provide an independent check on the whole process of setting and marking.
The rubric on each paper indicates a prescribed number of answers required (e.g. "candidates are required to submit answers to no more than five questions"). Candidates will be asked to indicate on their cover sheet which questions, up to the prescribed number, they are submitting for marking. If the cover slip is not completed then the examiners will mark the first five questions in numerical order by question number. The examiners will NOT mark questions in excess of the prescribed number. If fewer questions than the prescribed number are attempted, (i) each missing attempt will be assigned a mark of zero, (ii) for those questions that are attempted **no** marks beyond the maximum per question indicated under section 2(2) above will be awarded and (iii) the mark for the paper will still be calculated out of 100.

As the total number of students is small, it is not unusual for mean marks to vary from paper to paper, or year to year. It is not therefore normal practice to adjust marks to fit any particular distribution. However, where marks for papers are unusually high or low, the examiners may, having reviewed the difficulty of the paper set or other circumstances, decide with the agreement of the external examiner to adjust all marks for those papers. Such adjustment is referred to as 'scaling' and the normal procedure will be as follows:

a. Papers with a *mean taken over all candidates* of less than 55% or more than 75% are normally adjusted to bring the *mean* respectively up to 55% or down to 75%. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's score for the paper.
b. For papers with a mean in the ranges either of 55-60% or 70-75%, including those scaled under (i) above, the questions and typical answers are compared in order to ascertain, with the help of the external examiners, whether the marks are a fair reflection of the performance of the candidates as measured against the class descriptors. If not, the marks are adjusted. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's score for the question or for the paper.
c. The mean mark and the distribution of marks, both taken over all written papers, are considered, again with the help of the external examiners, in order to ascertain whether these overall marks are a fair reflection of the performance of the candidates as measured against the class descriptors. If not, the overall marks are adjusted. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's overall score.

(4) *Marking of Second Year Practicals for Part I*

Second year practicals are assessed continually by senior demonstrators in the teaching laboratory and in total are allocated 60 marks. Part I examiners have the authority to set a practical examination.

(5) *Marking Industrial Visits*

Four industrial visit reports should be submitted during Part I. Reports are assessed by the Industrial Visits Academic Organiser on a satisfactory / non-satisfactory basis, and are allocated a total of 20 marks.

(6) *Marking Engineering and Society Essays*

The business plan for "Entrepreneurship and new ventures" is double marked, blind, by two assessors; last year one assessor was from ISIS Innovation and one was appointed by the Faculty of Materials. The business plan is allocated a total of 20 marks.

If the Foreign Language Option or a Supplementary Subject has been offered instead of the Business Plan, the reported % mark, which is arrived at in accordance with the CVCP degree class boundary descriptors, is divided by five to give a mark out of 20.

(7) *Marking the Team Design Project*

The team design project is double marked, blind, by two of the Part I Examiners. They then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each project and each team member. Supervisors of the projects submit a written report to the examiners on the work carried out by their teams and these are taken into consideration when the examiners decide the final agreed marks. Industrial representatives may be asked to contribute to the assessment process. The project is allocated 50 marks, of which 25 are for the written report and 25 for the oral presentation. The same two examiners assess both the reports and the presentations.

(8) *Marking the Characterisation of Materials and the Introduction to Materials Modelling modules*

The reports for these modules are double marked, blind, by the module assessors. Normally, at least one of the two assessors for each report will be a module organizer. The assessors then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each report. The Chairman of Examiners oversees this process, sampling reports to ensure consistency between the different pairs of assessors and the two modules. The lead organizer for the Characterisation Module submits to the Assessors and Examiners of the module a short report which provides, by sample set only, (i) a summary of the availability of appropriate characterization instruments during the two-week module and (ii) any other pertinent information. An analogous report is provided by the lead organizer for the Modelling Module in respect of the software & hardware required for each mini-project. The Report for the Characterisation module is allocated 50 marks and each of the two reports for the Modelling module are allocated 25 marks.

3. PART II

The Part II project is assessed by means of a thesis which is submitted to the Examiners, who will also take into account a written report from the candidate's supervisor*****.

The project is allocated 400 marks, which is one third of the total marks for Parts I and II. Two Part II examiners read the thesis, including the project management chapter, together with Part A of the supervisor's report, and each of them independently allocates a provisional mark based on the guidelines****** published in the course handbook. In addition, normally the thesis will be read by one of the two external examiners.

A *viva voce* examination is held: the purpose of the viva is to clarify any points the readers believe should be explored, and to ascertain the extent to which the work reported is the candidate's. An examiners' discussion is held after the viva, involving all Part II examiners, and at which time Part B of the supervisor's report is taken into account. The outcome of the discussion is an agreed mark for the project. In arriving at the agreed mark the Examiners will take into account all of the following, (i) the opinion of the external examiner who has read the thesis, (ii) the candidate's understanding of their work as demonstrated during the viva and (iii) the comments and provisional marks of the original markers. It is stressed that it is the scientific content of the project and the candidate's understanding of their work that is being considered in the viva.
If the two provisional marks allocated in advance of the viva differ significantly (that is, normally by more than 10% of the total available for the project) this will be addressed explicitly during the discussion after the viva. In the majority of other cases the viva has only a small influence on the agreed mark awarded to a Part II thesis.

If there are believed to be mitigating circumstances, such as illness, which may have affected the candidate's progress with the project these should, in the normal way, be drawn to the attention of the Senior Tutor at the candidate's college, who will, if appropriate, inform the Proctors. The Proctors may in turn communicate with the Chairman of Examiners about the mitigating circumstances. Subject to guidance from the Proctors, if appropriate the Board of Examiners will take into account these mitigating circumstances in their discussion after the viva.

***** The Supervisor's report is divided into Parts A & B: Part A provides simple factual information that is of significance to the examiners, such as availability of equipment, and is seen by the two markers before they read and assess the thesis. Part A does **not** include personal mitigating circumstances which, subject to guidance from the Proctors, normally are considered only in discussion with **all** Part II examiners thus ensuring equitable treatment of all candidates with mitigating circumstances. Part B of the supervisor's report provides her/his opinion of the candidate's engagement with the project and covers matters such as initiative and independence; it is not seen by the examiners until the discussion held after the viva.

****** These guidelines may change and candidates are notified of any such changes before the end of Hilary Term of their 4th year.

4. CLASSIFICATION

The following boundaries (CVCP) and descriptors (MPLSD) are used as guidelines:

Class I Honours 70 – 100	The candidate shows excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and is able to use that knowledge innovatively and/or in unfamiliar contexts.
Class IIi Honours 60 – 69	The candidate shows good or very good problem-solving skills, and good or very good knowledge of much of the material over a wide range of topics.
Class IIii Honours 50 – 59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
Class III Honours 40 - 49	The candidate shows reasonable understanding of at least part of the basic material and some problem solving skills. Although there may be a few good answers, the majority of answers will contain errors in calculations and/or show incomplete understanding of the topics.
Pass 30 - 39	The candidate shows some limited grasp of basic material over a restricted range of topics, but with large gaps in understanding. There need not be any good quality answers, but there will be indications of some competence.
Fail 0 - 29	The candidate shows inadequate grasp of the basic material. The work is likely to show major misunderstanding and confusion, and/or inaccurate calculations; the answers to most of the questions attempted are likely to be fragmentary only.

In borderline cases the examiners use their discretion and consider the overall quality of the work the candidate has presented for examination. The external examiner often plays a key role in such cases.

Part I:

Unclassified Honours – The examiners are required to classify each candidate according to her/his overall average mark in Part I as (a) worthy of Honours, (b) Pass or (c) Fail. A candidate is allowed to proceed to Part II only if he/she has been adjudged worthy of honours by the examiners in Part I. The examiners do not divide the categories further but tutors and students may infer how well they have done from their marks. Candidates adjudged worthy of honours normally proceed to Part II but they may, if they wish and subject to approval from the relevant bodies, leave after Part I in which case an Unclassified Honours B.A. degree will be awarded.

Pass – The examiners consider that the candidate is not worthy of honours and therefore will not be allowed to proceed to Part II. The candidate may leave with a B.A. (without honours) or may retake Part I the following year (subject to college approval).

Fail – The examiners consider that the candidate is not worthy of a B.A. The candidate either leaves without a degree or may retake Part I the following year (subject to college approval).

Part II:

Classified Honours – Once marking is completed for both Parts I and II an overall percentage mark is computed for each candidate and classification then takes place. Subject to the requirement that Part II be adjudged worthy of honours (see below), classification is based solely on the overall percentage mark; the candidate's profile of marks from each element of assessment is only taken into account in borderline cases. However, a candidate cannot be awarded an M.Eng. degree unless his/her performance in Part II is adjudged worthy of honours i.e. a candidate must be adjudged worthy of honours both in Part I and in Part II to be awarded the M.Eng. degree. Failure to achieve honours in Part II will result in the candidate leaving with an unclassified B.A. (Hons) irrespective of the aggregate mark.

Pass – Notwithstanding the award of unclassified honours in Part I, the examiners consider that the candidate's overall performance is not worthy of an M.Eng. The candidate is listed as a Pass on the class list and is awarded an unclassified B.A. (Hons) on the basis of Part I performance.

Fail – The examiners consider that the candidate's overall performance is not worthy of an M.Eng. *and* that the performance in Part II is not worthy of a Pass. The candidate is excluded from the class list but is nevertheless awarded an unclassified B.A. (Hons) on the basis of Part I performance.

- The examiners cannot award unclassified honours on the basis of Part II performance unless permitted to do so by the Proctors.
- Nevertheless, candidates awarded a Pass or a Fail by the Part II examiners leave with an unclassified B.A. (Hons) because they were judged worthy of that in Part I (i.e. their degree is the same as if they had left immediately after Part I).
- In terms of the degree awarded, there is no difference between a Pass and a Fail in Part II. The only difference is whether or not the name appears on the class list.
- Candidates cannot normally retake Part II because the Examination Regulations require that they must pass Part II within one year of passing Part I. This rule can only be waived in exceptional circumstances, with permission from the Education Committee.

Annex: Summary of marks to be awarded for different components of the MS Final Examination in 2012 (For Part I and Part II students who embarked on the FHS respectively in 2010/11 and 2009/10)

	Component	**Mark**
Part I	General Paper 1	100
	General Paper 2	100
	General Paper 3	100
	General Paper 4	100
	Materials Options Paper 1	100
	Materials Options Paper 2	100
	Practicals & Industrial visits	80
	Engineering and Society coursework	20
	Team Design Project	50
	Characterisation or Modelling module	50
Part I Total		*800*
Part II	Thesis	400
Overall Total		*1200*

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS ECONOMICS AND MANAGEMENT, PART I EXAMINATION

Part I

A. STATISTICS

(1) **Numbers and percentages in each category**

The Part I Examination in Materials Economics and Management is unclassified. No distinctions are awarded. Since the number of candidates in this and previous years is less than 6, numerical data is confidential (see section E, below).

(2) **The use of vivas**

As stated in the Examination Conventions, vivas are no longer used in the Part I examination.

(3) **Marking of scripts**
All scripts were double-blind marked by the Examiners. The full procedures are described in the Examination Conventions.

B. NEW EXAMINING METHODS AND PROCEDURES

None this year.

C. CHANGES IN EXAMINING METHODS, PROCEDURES AND CONVENTIONS WHICH THE EXAMINERS WOULD WISH THE FACULTY AND THE DIVISIONAL BOARD TO CONSIDER

Candidates should be given further clarification that one of the requirements to pass the examination is that all practicals must be completed and the write-ups submitted by the stipulated deadline.

D. EXAMINATION CONVENTIONS

The previous year's Examination Conventions were included in the Course Handbook that was distributed to all candidates in hard-copy and was also made available on the Departmental website, to which candidates' attention was drawn by e-mail. The current year's Conventions were put on the Departmental website and sent electronically, along with other information in a letter from the Chair of Examiners to all candidates, on 16 March 2012, and in hard-copy for the start of Trinity term. The Examination Conventions were agreed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There was 1 candidate for the examination. The examination consisted of 7 written papers plus coursework that included a team design project, industrial visit reports and practical work carried out during the 2nd and 3rd year. One of the written papers (Introductory Economics) is taken in the 2nd year.

The written papers consisted of 4 Materials papers, 2 Economics papers and 1 Management paper, each of which lasted 3 hours. For the Materials papers, candidates were required to answer 5 questions out of 8, as in previous years. The Economics and Management Examiners followed their usual procedures. Team design projects were marked by two Examiners, including the Chairman. Teams were marked as groups. The allocation of bonus or penalty marks is permitted under the Conventions, but was not used. Reports for each of the Industrial Visits were assessed as pass/fail by the Industrial Visits Organiser, appointed as Assessor.

The overall mean mark for Part I (MS and MEM) was at the lower end of the 2(i) band. All MS and MEM general papers and option papers results were considered. After extensive deliberation, the examiners scaled paper GP1 by adding 3% points to each candidate's overall mark for that paper. None of the other papers were scaled. GP1, GP2 and GP 4 were in the high 2(ii) band. GP3 was in the middle of the 2(ii) band.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

There was only one candidate.

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

All candidates took the same papers for the whole examination.

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Detailed comments on the written examination papers and overall candidates' performance on individual questions are attached.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIALS WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

(1) **Numbers and percentages in each category**

[redacted]

(2) **Breakdown of the results by gender**

	Overall mark		Written Examinations		Coursework	
mark (%)	Male	Female	Male	Female	Male	Female
40–50	[redacted]					
50–60						
60–70						
70–80						
80–90						
Totals						

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

MEM:

Prof. M.R. Castell (Chairman)

Dr H.E. Assender

Prof. T.J. Marrow

Dr K.A.Q. O'Reilly

Prof. S.G. Roberts

Dr A.A.R. Watt

Dr D.N. Barron (Management)

Dr A.J. Nicholls (Management)

Dr N. Vulkan (Management)

Dr J.E. Thanassoulis (Economics)

Dr A.W. Beggs (Economics)

Prof. J.G.P. Binner (External)

Prof. W.M. Rainforth (External)

Prof. S.M. Wood (External, Management)

Prof. R.A. Mason (External, Economics)

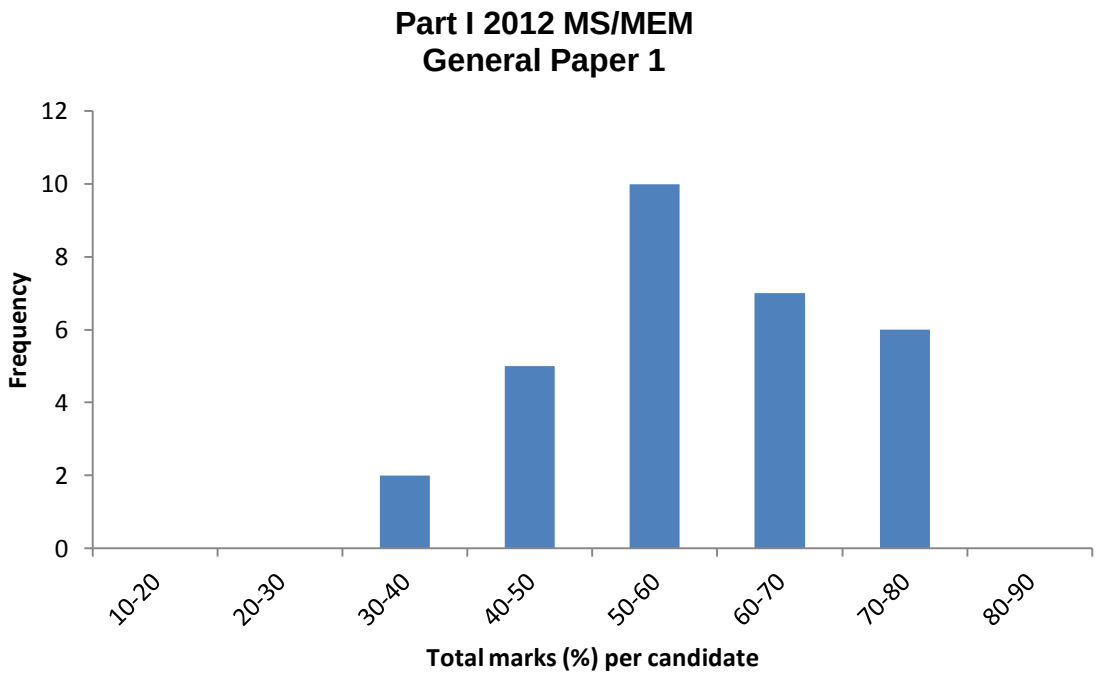
Attachments: Examination Conventions 2011/12 FHS Materials, Economics & Management
Comments on General Paper 1
Comments on General Paper 2
Comments on General Paper 3
Comments on General Paper 4
Comments on Economics papers
Comments on Introduction to Management paper

General Paper 1 – Structure and Transformations

Examiner: **Prof. James Marrow**
Candidates: **30 (29 MS / 1 MEM)**
Mean mark: **58.77%**
Maximum mark: **80%**
Minimum mark: **39%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	14	13.86	17.5	7	Corrosion
2	16	6.41	8	4	Polymers
3	23	13.33	18.5	5.5	Segregation
4	23	11.33	17	5	Diffusion
5	11	10.14	12	8	Precipitation
6	21	12.48	16.5	6	Nucleation and Growth
7	20	11.38	18	3.5	Ternary phase diagrams
8	21	9.60	15.5	4	Powder processing



General Comments:

Overview: the paper presented a spread of marks slightly lower than the examination guidelines and a mean in the lower second band. The overall spread of attempted answers suggested the paper was well-balanced in terms of subject scope and difficulty, with the exception of question 2. As this might have restricted the question choice for candidates who did not attempt question 2, a degree of scaling was applied.

1. Most produced good answers. The majority missed the following points: the total corrosion current is the sum of the corrosion currents from the reduction of H_2 on Pt and Mn, and although Pt is detrimental to the corrosion of Mn, when coupled, increasing the Pt area further will only increase corrosion rates until the intersection of the Pt Tafel line with the Mn anodic line occurs at E=0V. Beyond this, there is no corrosion.

2. None scored highly. The majority were unable to give a description of liquid crystal phases (nematic, smectic etc) in terms of molecule shape, incorrectly provided descriptions of spherulites; nor were they able to describe the process by which cellular structure would be produced in polystyrene (production of bubbles by volatile gases), providing incorrect descriptions of structures at the molecular level.

3. Most gave satisfactory answers. Common errors were incomplete explanations of the role of grain boundaries, misunderstandings of site competition/co-segregation in terms of precipitates and not atoms and arithmetic errors in the calculation leading to non-realistic answers.

4. Generally good answers except for the derivation of the Matano equation; a few succeeded with this although some presented rather unusual mathematical leaps from Fick's second law to the required equation.

5. All gave reasonable descriptions of the thermodynamic construction for precipitation, but few gave clear descriptions of the thermodynamic driving forces, kinetic limiting processes and assumptions for the expected growth laws; derivations were presented without clear explanation in some cases.

6. Most gave satisfactory answers. Common errors were failure to recognise that the dependence of incubation rate on undercooling was too steep for its use to control grain size in castings, and to give a clear explanation that incubation time is due to the distribution of clusters formed at high temperature needing to grow.

7. Done to a fair standard, through the accuracy of plotting of the phase diagram was generally poor. This caused problems with the final part of the question for the majority, who failed to spot that the composition in b(ii) was below the liquidus inflexion, so no peritectic reaction occurs.

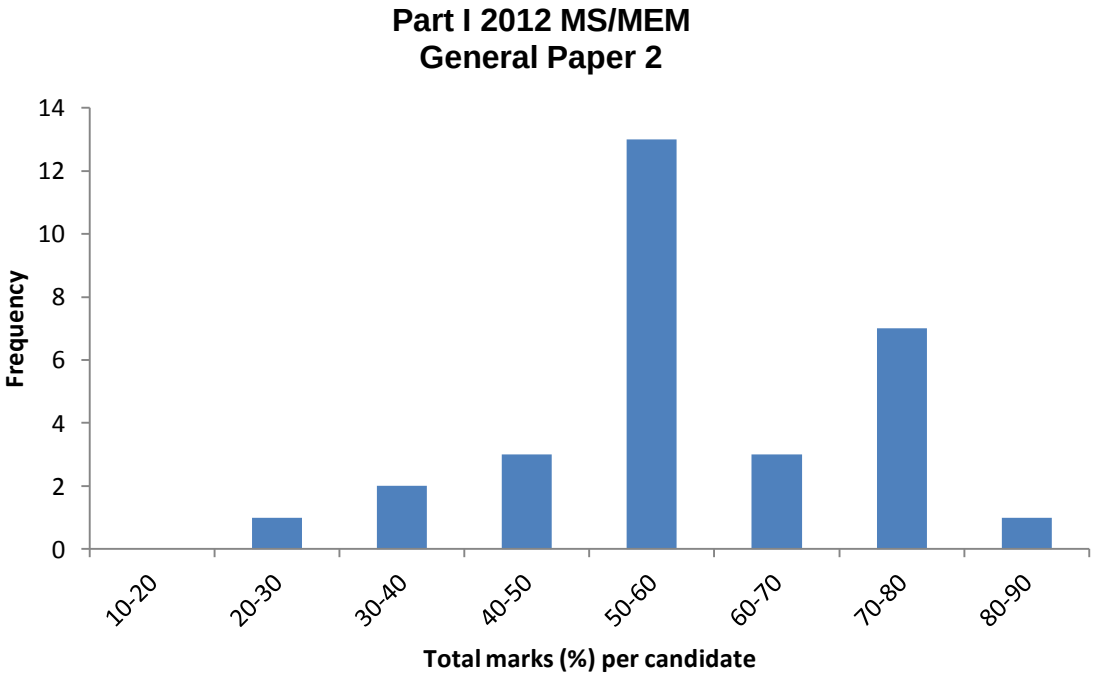
8. Most produced satisfactory answers, though the majority failed to provide sufficient information to demonstrate that they understood the main reasons for use of powder production for the particular applications.

General Paper 2 – Electronic Properties of Materials

Examiner: **Prof. Martin Castell**
Candidates: **30 (29 MS / 1 MEM)**
Mean mark: **59.27%**
Maximum mark: **90%**
Minimum mark: **27%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	24	13.60	19	10	Magnetic Properties of Materials
2	25	12.44	19	4	Statistical Mechanics
3	25	9.16	17	1	Quantum Mechanics
4	23	13.30	18.5	5.5	Tensor Properties
5	7	10.71	18	4	Electronic Structure
6	14	12.11	18.5	4.5	Electronic Structure
7	12	9.50	14	5	Electronic Properties of Materials
8	19	12.50	19	4	Semiconductors



General Comments:

The average for this paper was slightly lower than one might have hoped, but there was a broad range of marks, indicating that the more capable students were able to distinguish themselves. There was evidence of rote learning of derivations, such as in the travelling wave question (Q3), but with complicated derivations of this nature it was apparent that it is easy to come unstuck, resulting in poor marks. Oddly, the much simpler derivation of the ferroelectric catastrophe theory (Q8) was not tackled successfully by many students.

Question 1 on Magnetic Properties of materials was very popular and generally achieved high marks. The question was straightforward, with the possible exception of the last part which students tended either to answer correctly and achieve near full points, or not answer and achieve low points.

Question 2 on Statistical Mechanics was very popular and achieved high marks for most of the students who answered it. Surprisingly, some students had difficulty with the definition of a microstate. There were also some isolated difficulties with the calculation of probabilities.

Question 3 on wave mechanics was very popular, presumably because it was similar to worked examples in the lectures and tutorial problem sheet. However, from part b onwards the answers were almost all poor with many students demonstrating a lack of ability to deal with the solutions of travelling wave equations.

Question 4 on tensor properties of materials was popular and in the mean the marks were high. Parts a and b were mainly bookwork, but the calculation in part c required some thinking, which is where some of the students had difficulty.

Question 5 on the ionised hydrogen molecule was not popular. The mathematical nature of the question may have put some students off, though there was little maths to do in the actual solution. The results were highly bimodal in that the students received either high or low marks, but little in between.

Question 6 on electron band structure was below average popularity, possibly because the question was quite long. Some answers were very poor, demonstrating a poor understanding of the subject, but generally the students who attempted this question did relatively well.

Question 7 was a straightforward problem on pyroelectric and ferroelectric materials. It was not particularly popular and scored poorly. The greatest difficulty that students experienced was the mathematical description of the ferroelectric catastrophe theory in 1D, which is however standard tutorial work.

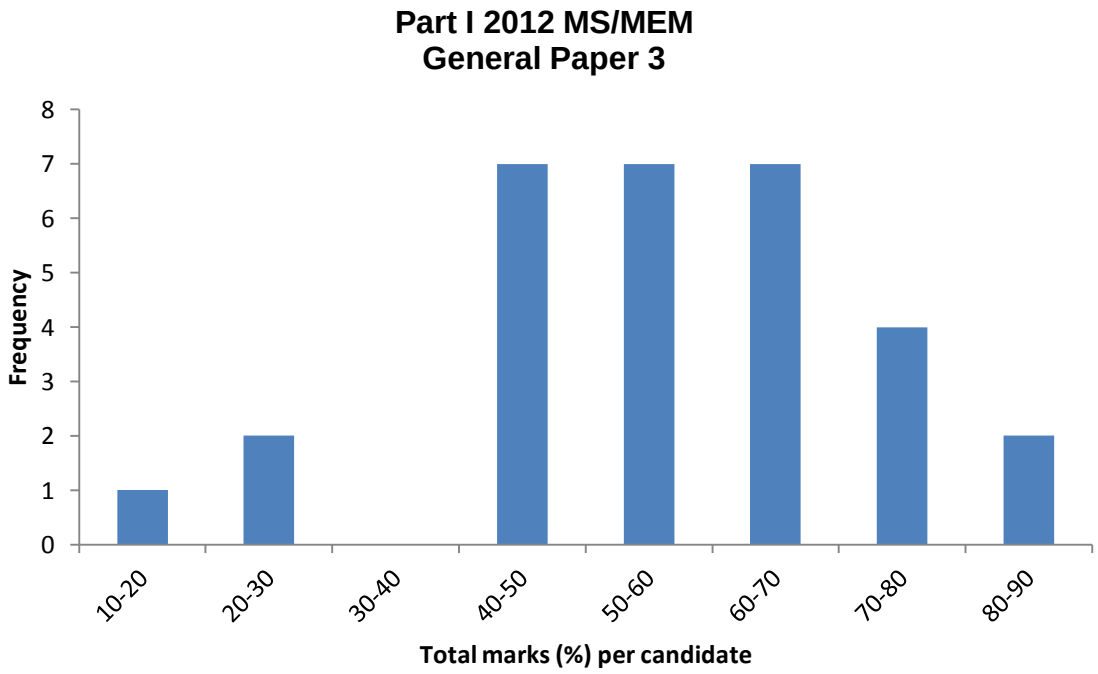
Question 8 on metal-semiconductor contacts was of average popularity. The answers were generally good with the exception of part c where most students were unable to answer the section completely.

General Paper 3 – Mechanical Properties

Examiner: **Prof. Steve Roberts**
Candidates: **30 (29 MS / 1 MEM)**
Mean mark: **56.77%**
Maximum mark: **83%**
Minimum mark: **18%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	8	8.75	18	3	Macroplasticity: yield criteria
2	28	12.25	16	5	Microplasticity: hardening.
3	15	12.53	18	6	Microplasticity, dislocations
4	24	11.46	19	4	Polymers: viscoelasticity
5	23	11.96	20	3	Isotropic elasticity
6	20	10.40	17	3	Fracture
7	10	8.50	11	5	Fatigue
8	19	13.63	19	3	Composites: toughness



General Comments

Overall, a rather disappointing set of answers. However, enough candidates scored well overall, and on all but one question, to reinforce the examiners' view that the standard of questions set was appropriate and fair. What was particularly disappointing was that very often the marks were lost in the first parts of the questions, which were aimed at establishing that those answering the question knew and understood at least the basic concepts involved, before proceeding to some more advanced ideas. Marks were often gained in "derivations" or similar things that could be rote-learnt.

1. Macroplasticity: yield criteria, torque. Only one candidate and understood the concepts in this question well enough to make a coherent attempt. All others managed the first "book work" sections by rote with varying degrees of success, and then collapsed.

2. Microplasticity: hardening mechanisms. Although a very popular question, this was not particularly well done by the majority of those attempting it. Most candidates were not clear what a "mechanism" is, and were generally vague about the concepts in the question. Rote answers to the "derivation" in section b, without much explanation, were very common. In section a there was very often confusion between the roles of solutes atoms and precipitates. There was also very often confusion between the concepts of force, stress, and energy.

3. Microplasticity, dislocation mechanics. There were easy marks to be got in this question for part d – which really needed no knowledge of dislocations at all. Even so, a few got nowhere with it. Various degrees of understanding were shown in sections a to c, from almost none, to very sound.

4. Polymers: viscoelastic behaviour. In retrospect, perhaps this question was too easy in sections a to c, for the marks given. Section d caused problems; few could actually derive the expression, though some had memorised the final result.

5. Isotropic elasticity. The "book work" stuff in section 8 was generally done well. In the problem that followed, students often had great difficulty in identifying boundary conditions – often looking at the rigid fibre (for example at r=0) rather than the metal that the question was actually about. Only one candidate could properly use, and only four attempted to use, a simple yield criterion in section c.

6. Fracture. Only one decent answer to this question. Most candidates were vague about basic ideas here, some fairly vague indeed.

7. Fatigue. Badly, or very badly, done by the few who attempted it. Candidates had difficulty with identifying the relevant parts of the graph, with units, with criteria for safety, and with working through the integral in b.iii.

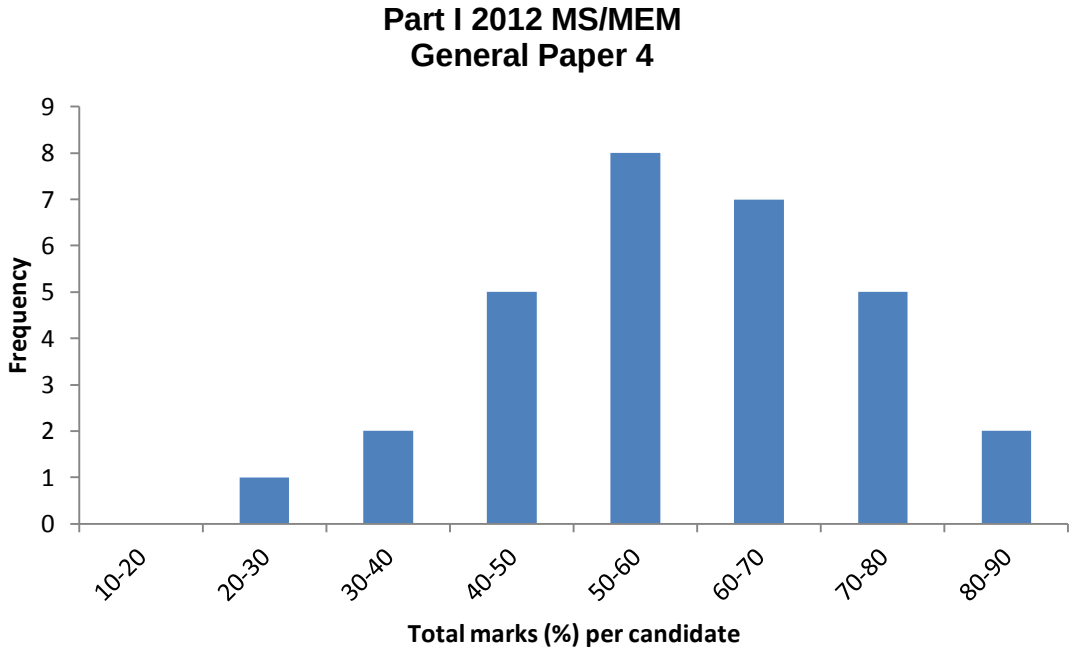
8. Composites: toughness. Many candidates appeared not to know what "toughness" actually is – so calculated rule-of-mixtures stresses or similar in part b. Many attempts at a.ii were unconvincing, with little or no explanation, and the maths fudged to get the result given in the question.

General Paper 4 – Engineering Applications of Materials

Examiner: **Dr Hazel Assender**
Candidates: **30 (29 MS / 1 MEM)**
Mean mark: **59.07%**
Maximum mark: **84%**
Minimum mark: **25%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	16	9.88	15	3	Polymers
2	15	11.40	18	5	Microstructural Characterisation
3	25	13.40	19	4	Microstructural Characterisation
4	20	12.10	18	5	Engineering Alloys
5	23	11.09	18	6	Engineering Alloys
6	13	14.23	18	6	Semiconductor Devices
7	17	11.88	19	3	Ceramics and Glasses
8	21	10.67	16	4	Ceramics and Glasses



General Comments

The mean mark for the paper came in under 60%, and there was a large spread in the marks. All questions had a consistently low lowest mark, but there were also excellent marks in many questions.

Question 1: *Extrusion of polymers.* Although answered by a good number of students, this question resulted in the lowest mean mark. (a) There was confusion shown by some candidates between extrusion and drawing. (bi) The least well answered section of the question, with some confusion over thermodynamics, and few candidates mentioned the effect of viscosity. (bii) Many candidates described general alignment rather than the high alignment that would produce high stiffness materials.

Question 2: *EDX*. The less popular of the two questions on this course. (a) Generally well answered basic start to the question, though some candidates confused electron promotion and electron removal. (b) Often no mention of the photoelectron or how the e/h pairs in the detector are collected. (c) The most poorly answered section of the question: many candidates considered the effect e.g. of removing background intensity rather than sample-dependant corrections. (d) Most candidates could determine the Cliff-Lorimer factor for Cu-Mn, but then often could not translate this into a composition.

Question 3: *Electron diffraction*. The most popular question, attracting a high mean mark. (a) Some candidates neglected the 'smearing' effect on the diffraction spots due to a thin sample. (b) Very well answered section with some errors in forming the cross-product. (c) Some candidates relied on overall symmetry rather than systematic absences. (d) The weakest part of the question: some confusion between θ and 2θ, and some did not get the relationship between a and d. (e) Many candidates got zero on this section, but those that attempted the calculation generally did it correctly.

Question 4: *Ni superalloys*. (a) A well-answered section of the question, with most candidates only dropping a couple of marks e.g. for wrong reasoning for the microstructure or poor reasoning for some alloying elements. (b) A greater spread of marks in this section. Many candidates did not discuss carbides and were weak on the changes in composition.

Question 5: *Mg alloys*. (a) Good answers, although some candidates did not mention the implication of the hcp structure. (b) Many candidates did not identify the correct alloy components, and several did not mention precipitation and quench/age. (c) Poorly answered section: few candidates mentioned gb pinning. (d) Poorly answered section: generally vague answers not specific to cast and sheet products.

Question 6: *Silicon bipolar transistors*. The least popular question, but one that attracted the highest mean mark. (a) A well-answered section, although some candidates lost marks on discussion of the differential voltages and the narrow base layer. (b) Dopant levels were sometimes quoted in the wrong order, which lead to incorrect reasons being given for their levels. The graded base explanations were often poor. (c) Generally candidates made a reasonable attempt at this section with slightly weak explanations.

Question 7: *Glasses and glass ceramics*. (a) The weakest section of the question with some very poor answers showing a lack of understanding of the nature of T_g and crystallization. (b) Generally well answered; some candidates did not give examples, and most marks were lost on network modifiers. (c) Several candidates described the wrong class of material: either liquid phase sintering or glasses. (d) A well-answered section.

Question 8: *Porosity in ceramics*. A low average mark for this question. (a) Candidates often could not give a range of origins for porosity. (b) The weakest section: many candidates did not know the specific cases given in the question and gave general 'sintering' answers. (c) Strong answers to this section, though some candidates gave a general description of sintering rather than relating their answers strongly to the microstructures given.

Examiners' Report for MEM 2012 – Economics Papers

Part I

1 candidate sat the *Introductory Economics* paper (compared to 11 the previous year) in 2011. The paper is also taken by as Prelims paper by PPE and E&M candidates and a detailed report can be found in the 2011 PPE examiners' report. For EEM scripts were double marked.

The candidate sat the *Microeconomics* paper in 2012. The paper the paper was identical to the Finals' paper sat by E&M (and PPE) candidates but MEM candidates had longer to sit the paper, 3 hours as opposed to 2 and a quarter hours, but had to answer an extra question. A detailed report can be found in the PPE Finals' examiners report.

Alan Beggs
John Thanassoulis

(Pending)

REPORT ON FINAL HONOURS SCHOOL OF MATERIALS ECONOMICS AND MANAGEMENT, PART II EXAMINATION

Part I

A. STATISTICS

(1) **Numbers and percentages in each category**
Candidates are given a mark on the basis of their performance in the Part II examination and then given a classification on the basis of their performance across Part I and Part II. Since the number of candidates in previous years is less than 6, numerical data for these years is confidential (see section E, below).

Class	Number	Percentage
	2011/12	2011/12
I	2	33.3
II.I	4	66.6
II.II	-	-
III	-	-
Pass	-	-
Fail	-	-
Total	6	-

(2) **The use of vivas**
Vivas were not used for this Examination.

(3) **Marking of scripts**
All scripts were double-blind marked by the Examiners and Assessors. The full procedures are described in the Examination Conventions.

B. NEW EXAMINING METHODS AND PROCEDURES

None this year.

C. CHANGES IN EXAMINING METHODS, PROCEDURES AND CONVENTIONS WHICH THE EXAMINERS WOULD WISH THE FACULTY AND THE DIVISIONAL BOARD TO CONSIDER

None this year.

D. EXAMINATION CONVENTIONS

The previous year's Examination Conventions were included in the Course Handbook that was distributed to all candidates in hard-copy and was also made available on the Departmental website, to which candidates' attention was drawn by e-mail. The current year's Conventions were put on the Departmental website and sent electronically, along with other information in a letter from the Chair of Examiners to all candidates, on 16 March 2012, and in hard-copy for the start of Trinity term. The Examination Conventions were agreed by the Board of Examiners and the Department's Academic Committee.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

There were 6 candidates for the examination. The examination consisted of 2 written papers, one being a compulsory Materials Options paper, and the other paper being selected from a range of Economics and Management options. For the Materials Options paper, candidates were offered 12 questions in 6 sections each containing 2 questions; candidates were required to answer 4 questions, 1 from each of three sections and 1 from any of the same three sections.

In addition to the written papers, candidates are required to submit a report on a 24-week industrial placement, which has the weight of 2 written papers. The reports on these 24-week Management projects are marked by staff at the Said Business School. For reasons of anonymity, the details of the overall mean marks are discussed in Section E, below.

B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

Due to the small number of candidates for this examination, the numerical data is confidential (see section E, below).

C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

Due to the small number of candidates numerical data is confidential (see section E, below).

D. COMMENTS ON PAPERS AND INDIVIDUAL QUESTIONS

Detailed comments on the written examination papers and overall candidates' performance on individual questions are attached.

E. COMMENTS ON THE PERFORMANCE OF IDENTIFIABLE INDIVIDUALS AND OTHER MATERIALS WHICH WOULD USUALLY BE TREATED AS RESERVED BUSINESS

For reasons of anonymity, the details of the overall mean marks are discussed in this section. For Parts I and II combined the average mark was in the high 2(i) range.

(1) **Numbers and percentages in each category**
Candidates are given a mark on the basis of their performance in the Part II examination and then given a classification on the basis of their performance across Part I and Part II. There were 6 candidates for the examination, with four being awarded 2:i Honours and the other two being awarded 1 Honours.

Class	Number			Percentage (%)		
	2011/12	2010/11	2009/10	2011/12	2010/11	2009/10
I	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
II.I	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
II.II	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
III	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pass	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fail	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

(2) **Breakdown of the results by gender**

	Overall mark		Part 2 Mark		Part 1 Mark	
mark (%)	Male	Female	Male	Female	Male	Female
0 - 40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
40–50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
50–60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
60–70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
70–80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
80–90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Totals	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

(3) **Candidates' Performance in each part of the examination**

[redacted]

(4) **Equal Opportunities issues**

[redacted]

F. NAMES OF MEMBERS OF THE BOARD OF EXAMINERS

MEM:

Prof. M.R. Castell (Chairman)
Dr H.E. Assender
Prof. T.J. Marrow
Dr K.A.Q. O'Reilly
Prof. S.G. Roberts
Dr A.A.R. Watt
Dr D.N. Barron (Management)
Dr A.J. Nicholls (Management)
Dr N. Vulkan (Management)
Dr J.E. Thanassoulis (Economics)
Dr A.W. Beggs (Economics)

Prof. J.G.P. Binner (External)
Prof. W.M. Rainforth (External)
Prof. S.M. Wood (External, Management)
Prof. R.A. Mason (External, Economics)

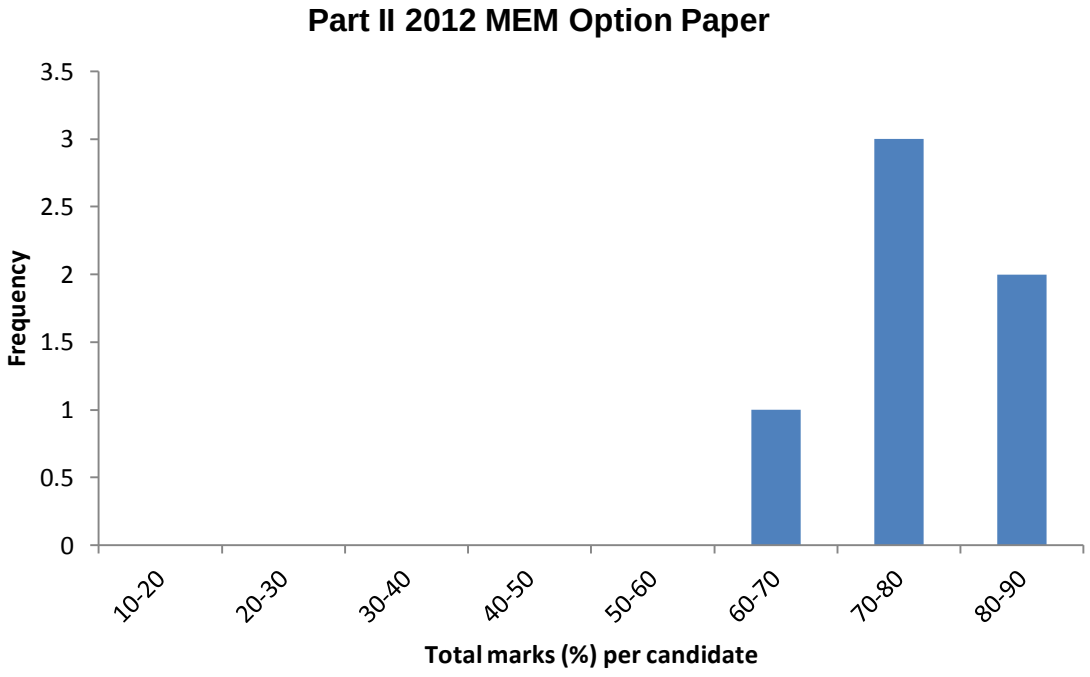
Attachments: Examination Conventions 2011/12
Comments on Materials Option Paper 2
Comments on Economics paper

Materials Options Paper 2

Examiner: **Dr Keyna O'Reilly**
Candidates: **6 (MEM)**
Mean mark: **76%**
Maximum mark: **90%**
Minimum mark: **65%**

Detailed comments on the paper are as follows:

Question	No of Answers	Average Mark	Highest Mark	Lowest Mark	Topic
1	3	21.17	24.5	17	Polymer crystallisation
2	3	21.67	23	21	Phase instability in polymers
3	4	17.75	21	15	Cast irons
4	0	n/a	0	0	Defects in welds & shape-castings
5	3	15.67	18	12	Energy storage & heat exchangers
6	0	n/a	0	0	Future power generator materials
7	3	20.17	23	18	Advanced composites
8	0	n/a	0	0	Materials for high T applications
9	4	19.50	22	16	Natural materials
10	4	17.50	18	16	Materials for hip replacements
11	0	n/a	0	0	Devices
12	0	n/a	0	0	Partially stabilized zirconia



General Comments

Generally the paper was well done, with a particularly high average mark for the 4th year MEM candidates.

Specific Comments

ADVANCED POLYMERS

Question 1. Polymer crystallisation.

Not a very popular question. Candidates generally did not provide full answers in the context of materials properties and in cases demonstrated a lack of understanding of the relationship between the glass transition temperature and the polymer's ability to crystallize. Not all candidates got the correct axes for the Guinier plot. For the numerical sections, most candidates had the correct approach, but several made sloppy mistakes and used incorrect units.

Question 2. Phase instability in polymers.

Again, not a very popular question. Few candidates could provide a clear description of the dependency of the phase behaviour on molecular weight. Part (b) was generally well answered. In part (c) some candidates didn't justify the criterion applied, and some applied the wrong criterion.

ADVANCED MANUFACTURE WITH METALS AND ALLOYS

Question 3. Cast irons.

A popular question on cast irons. Several candidates gave clear and detailed explanations of the mechanisms involved, though a number of candidates did not clearly separate the mechanisms which affected nucleation from those that affected growth. The section on surface treatment was generally not very well done, with very few answers to the section on vitreous enamelling. Most candidates could say something about the post-casting processing of white cast irons to produce white-heart and black-heart iron, but generally lacked detail regarding the specific conditions, microstructures and properties.

Question 4. Defects in welds & shape-castings.

A reasonably unpopular question on defects in welding and shape-casting. Most candidates made a reasonable attempt at describing how shrinkage and gas porosity arise, but many did less well at drawing out the similarities and differences between the defect formation in the two processes. A significant number of candidates did seem to know what residual stresses are. Candidates were generally weaker at describing the approaches to defect minimisation in arc welding than in conventional sand casting, and similarly, they knew more about the Cosworth casting process than friction stir welding.

MATERIALS FOR ENERGY PRODUCTION< DISTRIBUTION AND STORAGE

Question 5. Energy storage & heat exchangers.

A reasonably popular question on energy storage and heat exchangers. In (a), candidates often confined their answers only to the balancing of energy demand across a day. In (b) many candidates answered as for a general capacitor, giving an incorrect diagram and saying little about their properties. There were some good answers to the comparison with conventional rechargeable batteries, though some candidates failed to attempt this part of the question. In part (c), a few candidates were only able to outline the approach, but most gave good answers. Not all candidates attempted the final calculation.

Question 6. Future power generator materials.

An unpopular question on materials for future power generating plant. Generally the level of detail was less than expected regarding the principles of operation of the reactors as opposed to the physics of the processes. There was a lack of specific detail given regarding the materials chosen for the various components.

ADVANCED ENGINEERING ALLOYS AND COMPOSITES

Question 7. Advanced composites.

A reasonably popular question on advanced composite materials. Generally, candidates lacked a knowledge of specific details when discussion the structure, and particularly the properties, of GLARE composites. In the section covering the processing of titanium matrix composites, most candidates had a general idea of the processes involved, but again lacked specific details and provided answers more at the level that would be expected in a General Paper. Few candidates could give specific examples of industrial applications, most only being able to say “aerospace”.

Question 8. Materials for high temperature applications.

An unpopular question on materials for high temperature applications. All three parts of the question lacked specific details relevant to the particular materials being asked about in the question. General answers about martensite, steels and microscopy techniques. On a level you might expect from the General Paper Engineering Alloys course. Part (a) in particular lacked an appreciation of the fact that the material being creep resistant would have an impact on its likely applications. No candidate discussed the strengthening mechanisms involved and no candidate gave any compositions.

BIOMATERIALS AND NATURAL MATERIALS

Question 9. Natural materials.

The most popular question on the paper. Candidates were generally weakest at describing the chemical nature of phospholipids and the conformation of polysaccharides. Candidates were also rather weak at describing why hierarchy arises. When discussing applications in tissue engineering, candidates were generally weak in describing cell anchoring and degradation products.

Question 10. Materials for hip replacements.

Another very popular question on total hip replacements. There was little comment as to alternatives for total hip replacements, and a few candidates didn’t discuss osteoporosis at all. When discussing the components of a total hip replacement, some candidates missed out one of the components entirely. Some candidates did not discuss the possibility of stem/ball failure and some had little on polymer wear.

DEVICES, MEMORY AND STORAGE

Question 11. Devices.

Generally a reasonably well answered but rather unpopular question. Weaker candidates struggled with the second part of (b), and a number of candidates missed the point that a material with a higher permittivity was required in the third part of (b).

Question 12. Partially stabilized zirconia.

A popular and straightforward question on PZT. There were several very good answers where the candidates had clearly understood the material and could put it into their own words. The phase diagram for PZT was the least well remembered part. A number of candidates scored less that 10 marks, and clearly knew rather little about the topic.

Examiners' Report for MEM 2012 – Economics Papers

Part II

Three papers were available to Part II candidates: Macroeconomics, Econometrics and Game Theory. Economic Decisions within the Firm, which had been popular in previous years, was not available. Detailed overall reports be found in the PPE Finals' examiners report. Numbers are too small to make meaningful comparisons with performance of candidates in other schools.

[redacted]

Alan Beggs
John Thanassoulis

Examination Conventions 2011/12
Final Honours School
Materials, Economics and Management

1. INTRODUCTION

The formal procedures determining the conduct of examinations are established and enforced by the University Proctors. These conventions are a guide to the examiners and candidates but the regulations set out in the Examination Regulations have precedence. The examiners are nominated by the Nominating Committee* in the Department of Materials and those nominations are submitted for approval by the Vice-Chancellor and the Proctors. Formally, examiners are independent of the Department and of those who lecture courses. However for written papers on Materials Science in Part I and Part II, examiners are expected to consult with course lecturers in the process of setting questions. The paragraphs below indicate the conventions to which the examiners usually adhere, subject to the guidance of the appointed external examiners, and other bodies such as the Academic Committee in the Department, the E(M)EM Standing Committee, the Mathematical, Physical and Life Sciences Division, the Social Sciences Division, the Education Committee of the University and the Proctors who may offer advice or make recommendations to examiners. It must be stressed that to preserve the independence of the examiners, candidates are not allowed to make contact directly about matters relating to the content or marking of papers. Any communication must be via the Senior Tutor of your college, who will, if he or she deems the matter of importance, contact the Proctors. The Proctors in turn communicate with the Chairman of Examiners.

Marking criteria for the Team Design Project are published in the FHS course handbook.

During the marking process the scripts of all written papers remain anonymous to the markers.
[In some of the descriptions of marking for individual elements of coursework that are given later in this document the term 'double marked, blind,' is used; this refers to the fact that the second marker does not see the marks awarded by the first marker until he or she has recorded his or her own assessment, and does not indicate that the candidate is anonymous to the markers.]

Late Submission of or Failure to Submit Coursework
The Examination Regulations stipulate specific dates for submission of the required pieces of coursework to the Examiners (1. A set of detailed reports of practical work; 2. A Team Design Project Report; 3. Industrial Visit Reports as specified in the course handbook; and 4. A Part II Management Project Report). Rules governing late submission and any consequent penalties are set out in the 'Late submission of work' sub-section of the 'Regulations for the Conduct of University Examinations' section of the Examination Regulations (pp46-47 of the 2011 Regulations).

Under the provisions permitted by the regulation, late submission of coursework for Materials Science or Materials, Economics & Management examinations will normally result in the following penalties:

(a) With permission from the Proctors under clause (1) of para 16.8, no penalty.
(b) With permission from the Proctors under clauses (3) + (4) of para 16.8, for the first day or part of the first day that the work is late a penalty of a reduction in the mark for the coursework in question of up to 10% of the maximum mark available for the piece of work, and for each subsequent day or part of a day that the work is late a further penalty of up to 5% of the maximum mark available for the piece of work; the exact penalty to be set by the Examiners with due consideration given to any advice given in the Proctors' "Notes for the Guidance of Examiners and Chairmen of Examiners".
(c) Where the candidate is not permitted by the Proctors to remain in the examination he or she will be deemed to have failed the examination as a whole.

Where no work is submitted or it is proffered so late that it would be impractical to accept it for assessment the Proctors may, under their general authority, and after (i) making due enquiries into the circumstances and (ii) consultation with the Chairman of the Examiners, permit the candidate to remain in the examination. In this case the Examiners will award a mark of zero for the piece of coursework in question.

* for the 2011-12 examinations the Nominating Committee comprised Dr Czernuszka , Prof Grovenor & Dr Taylor.

Penalties for late submission of individual practical reports are set out in the MS/MEM FHS Handbook and are separate to the provisions described above.

2. PARTS I & II

Candidates taking Ec1: Introductory Economics in the 2nd year.
MEM candidates sit the compulsory Ec1: Introductory Economics paper in Trinity Term of their second year. This paper will be set and examined as for all other Part I and Part II Economics papers (see below) and contributes to the Part I mark. The marks for this paper will be formally ratified by the Board of examiners for Part I examinations held in the Trinity Term following that in which the Ec1 paper is sat.

Candidates for Part I (3rd year)
Part I candidates take four compulsory Materials papers (General Papers 1 – 4); one compulsory Economics paper; and one compulsory Management paper. In addition, candidates are assessed on their Materials coursework (practical work, the team design project, and industrial visits). Marks from the Ec1 paper sat in Trinity Term of the 2nd year are included in the Part I total.

Candidates for Part II (4th year)
Part II candidates take one compulsory Materials Options paper and one paper from a range of Management and Economics options. In addition they are assessed on their report of a six-month industrial placement, which carries the weight of two papers.

(1) *Setting of papers*

Part I Materials General Papers 1 – 4 are set by the materials examiners in consultation with course lecturers. The responsibility for the setting of each examination paper is assigned to an examiner, and a second examiner is assigned as a checker. The Materials Option paper in Part II is set by lecturers of option courses and two examiners, the examiners acting as checkers. For the Materials papers, the examiners, in consultation with lecturers, produce model answers for every question set and the wording and content of all examination questions set, and the model answers, are scrutinised by all examiners, including, in particular, the external examiners.
The Economics and Management papers are set by examiners nominated respectively by the Economics Faculty and the Saïd Business School.

(2) *Paper format*

Materials Papers
All Materials general papers comprise eight questions from which candidates attempt five and are taken in Part I. Each question is worth 20 marks. The total number of marks available on each general paper is 100. Materials Option papers comprise one section for each twelve-hour Options lecture course, each section containing two questions: candidates are required to answer one question from each of any three sections and a fourth question drawn from any one of the same three sections. The total number of marks available on each option paper is 100, and all questions carry equal marks. Questions are often divided into parts, with the marks for each part indicated on the question paper.

Economics and Management papers
Candidates are advised to read particularly carefully the specific instructions on the front of each paper as to the number of questions they should submit, since the rubrics on Economics and Management papers differ slightly from those for the Materials papers.

(3) *Marking of papers*

Materials Papers
All scripts are double marked, blind, by the setter and the checker. After individual marking the two examiners meet to agree marks question by question. If the differences in marks are small (~10%, 2-3 marks for most questions), the two marks are averaged, with no rounding applied. Otherwise the examiners identify the discrepancy and read the answer again, either in whole or in part, to reconcile the differences. If after this process the examiners still cannot agree, they seek the help of the Chairman, or another examiner as appropriate, to adjudicate. An integer total mark for each paper is awarded, where necessary rounding up to achieve this.

The Materials Options paper is marked by course lecturers acting as assessors and an examiner acting as a checker.

The Materials external examiner provides an independent check on the whole process of setting and marking.

The rubric on each paper indicates a prescribed number of answers required (e.g. "candidates are required to submit answers to no more than five questions"). Candidates will be asked to indicate on their cover sheet which questions, up to the prescribed number, they are submitting for marking. If the cover slip is not completed then the examiners will mark the first five questions in numerical order by question number. The examiners will NOT mark questions in excess of the prescribed number. If fewer questions than the prescribed number are attempted, (i) each missing attempt will be assigned a mark of zero, (ii) for those questions that are attempted **no** marks beyond the maximum per question indicated under section 2(2) above will be awarded and (iii) the mark for the paper will still be calculated out of 100.

As the total number of students sitting some papers is small, it is not unusual for mean marks to vary from paper to paper, or year to year. It is not therefore normal practice to adjust marks to fit any particular distribution. However, where marks for papers are unusually high or low, the examiners may, having reviewed the difficulty of the paper set or other circumstances, decide with the agreement of the external examiners to adjust all marks for those papers. For the Materials papers such adjustment is referred to as 'scaling' and the normal procedure will be as follows:

a. Papers with a *mean taken over all candidates* of less than 55% or more than 75% are normally adjusted to bring the *mean* respectively up to 55% or down to 75%. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's score for the paper.
b. For papers with a mean in the ranges either of 55-60% or 70-75%, including those scaled under (i) above, the questions and typical answers are compared in order to ascertain, with the help of the external examiners, whether the marks are a fair reflection of the performance of the candidates as measured against the class descriptors. If not, the marks are adjusted. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's score for the question or for the paper.
c. The mean mark and the distribution of marks, both taken over all written papers, are considered, again with the help of the external examiners, in order to ascertain whether these overall marks are a fair reflection of the performance of the candidates as measured against the class descriptors. If not, the overall marks are adjusted. Normally this is achieved by adding/subtracting the same fixed number of marks to/from each candidate's overall score.

Economics and Management Papers
The rubrics on Management and Economics papers differ slightly from the above, but numerical marking is used and all examiners mark to the standard class boundaries [see section on classification] and range of marks (0-100). All scripts in Economics and Management are double-marked, blind. The two assessors who marked the script then meet in order to reach an agreed mark. Should they fail to agree, then the appropriate set of Economics and Management Examiners will determine the final mark.

In cases of short weight, the maximum achievable mark is lowered by the proportion of the paper missing. (For example, in a paper requiring four answers where a candidate has attempted only three, the maximum achievable mark is 75.) In cases where an answer has been partially completed, the marks will use their discretion to decide what proportion of the answer is missing. Marks reflecting such a penalty are flagged "SW" with the proportion of the paper completed (e.g. "SW 75%). In the case of overweight papers it is left to the discretion of the two markers to decide which of the material to disregard. In cases where the rubric requires candidates to show a specified breadth of knowledge, and where it is unambiguously clear that such a requirement has not been met, the mark for the script will be lowered by at least 5 points. Marks reflecting such a penalty are flagged by "RR" with the number of marks deducted.

As the total number of MEM students is small, it is not unusual for mean marks to vary from paper to paper, or year to year. It is not therefore normal practice to adjust marks to fit any particular distribution. However, where marks for papers are unusually high or low, the examiners may, having reviewed the difficulty of the paper set or other circumstances, decide with the agreement of the external examiners to adjust all marks for those papers. Where a paper has been taken by both MEM and EEM students normally the decision will be informed by the mean and the distribution of marks taken over all EEM & MEM candidates for that paper. Such adjustment is referred to as 'scaling' and in deciding what scaling, if any, to apply normally the examiners will take into account the following additional information:

(a) For each paper, comments from the MEM examiners representing the Economics or Management Faculty as appropriate
(b) A report by the Chairman of Examiners on any scaling adopted by the EEM examiners
(c) The performance of the MEM cohort and the MEM+EEM cohort on the other Economics and Management papers
(d) The performance of the MEM cohort on the Materials papers

(4) *Marking of Practicals for Part I*

Practicals are assessed continually by senior demonstrators in the teaching laboratory and in total are allocated 50 marks. Part I examiners have the authority to set a practical examination.

(5) *Marking Industrial Visits*

Four industrial visit reports should be submitted during Part I. Reports are assessed by the Industrial Visits Academic Organiser on a satisfactory / non-satisfactory basis, and are allocated a total of 20 marks.

(6) *Marking the Team Design Projects*

The team design project is double marked, blind, by two of the Part I Examiners. They then compare marks and analyse any significant disagreement between these marks before arriving at a final agreed mark for each project and each team member. Supervisors of the projects submit a written report to the examiners on the work carried out by their teams and these are taken into consideration when the examiners decide the final agreed marks. Industrial representatives may be asked to contribute to the assessment process. The project is allocated 50 marks, of which 25 are for the written report and 25 for the oral presentation. The same two examiners assess both the reports and the presentations.

(7) *Marking the 4th Year Management Project*

The management project is allocated 200 marks and is marked by the Saïd Business School.

The projects are assessed and graded independently by two Assessors. The supervisor's comments on the performance of the candidate are provided to the Assessors. The marks provided by the Assessors are moderated by an Examiner, and the final mark is ratified by the Board of Examiners.

The process is:

- Supervisors provide a report on the performance of the student, indicating any special circumstances that could have affected the student's performance on the project and report preparation.
- The project reports are graded blind by two Assessors, taking account of the Supervisor's comments. At least one of the Assessors will have knowledge of the area of the project.
- The Supervisor's report, and Assessors' reports and marks are provided to an Examiner, who moderates the marks and provides a final mark for ratification by the Board of Examiners.
- Supervisors may not act as Assessor or Examiner for a project they have supervised.
- An Assessor may also act as Examiner for a project. The Assessor should assess and mark the report before having sight of the other Assessor's report and marks.

3. CLASSIFICATION

The following boundaries (CVCP) and descriptors (MPLSD) are used as guidelines:

Class I Honours 70 – 100	The candidate shows excellent problem-solving skills and excellent knowledge of the material over a wide range of topics, and is able to use that knowledge innovatively and/or in unfamiliar contexts.
Class IIi Honours 60 – 69	The candidate shows good or very good problem-solving skills, and good or very good knowledge of much of the material over a wide range of topics.
Class IIii Honours 50 – 59	The candidate shows basic problem-solving skills and adequate knowledge of most of the material.
Class III Honours 40 - 49	The candidate shows reasonable understanding of at least part of the basic material and some problem solving skills. Although there may be a few good answers, the majority of answers will contain errors in calculations and/or show incomplete understanding of the topics.
Pass 30 - 39	The candidate shows some limited grasp of basic material over a restricted range of topics, but with large gaps in understanding. There need not be any good quality answers, but there will be indications of some competence.
Fail 0 - 29	The candidate shows inadequate grasp of the basic material. The work is likely to show major misunderstanding and confusion, and/or inaccurate calculations; the answers to most of the questions attempted are likely to be fragmentary only.

In borderline cases the examiners use their discretion and consider the overall quality of the work the candidate has presented for examination. The external examiner often plays a key role in such cases.

Part I:

Unclassified Honours – The examiners are required to classify each candidate according to her/his overall average mark in Part I as (a) worthy of Honours, (b) Pass or (c) Fail. A candidate is allowed to proceed to Part II only if he/she has been adjudged worthy of honours by the examiners in Part I. The examiners do not divide the categories further but tutors and students may infer how well they have done from their marks. Candidates adjudged worthy of honours normally proceed to Part II but they may, if they wish and subject to approval from the relevant bodies, leave after Part I in which case an Unclassified Honours B.A. degree will be awarded.

Pass – The examiners consider that the candidate is not worthy of honours and therefore will not be allowed to proceed to Part II. The candidate may leave with a B.A. (without honours) or may retake Part I the following year (subject to college approval).

Fail – The examiners consider that the candidate is not worthy of a B.A. The candidate either leaves without a degree or may retake Part I the following year (subject to college approval).

Part II:

Classified Honours – Once marking is completed for both Parts I and II an overall percentage mark is computed for each candidate and classification then takes place. Subject to the requirement that Part II be adjudged worthy of honours (see below), classification is based solely on the overall percentage mark; the candidate's profile of marks from each element of assessment is only taken into account in borderline cases. However, a candidate cannot be awarded an M.Eng. degree unless his/her performance in Part II is adjudged worthy of honours i.e. a candidate must be adjudged worthy of honours both in Part I and in Part II to be awarded the M.Eng. degree. Failure to achieve honours in Part II will result in the candidate leaving with an unclassified B.A. (Hons) irrespective of the aggregate mark.

Pass – Notwithstanding the award of unclassified honours in Part I, the examiners consider that the candidate's overall performance is not worthy of an M.Eng. The candidate is listed as a Pass on the class list and is awarded an unclassified B.A. (Hons) on the basis of Part I performance.

Fail – The examiners consider that the candidate's overall performance is not worthy of an M.Eng. *and* that the performance in Part II is not worthy of a Pass. The candidate is excluded from the class list but is nevertheless awarded an unclassified B.A. (Hons) on the basis of Part I performance.

- The examiners cannot award unclassified honours on the basis of Part II performance unless permitted to do so by the Proctors.
- Nevertheless, candidates awarded a Pass or a Fail by the Part II examiners leave with an unclassified B.A. (Hons) because they were judged worthy of that in Part I (i.e. their degree is the same as if they had left immediately after Part I).
- In terms of the degree awarded, there is no difference between a Pass and a Fail in Part II. The only difference is whether or not the name appears on the class list.
- Candidates cannot normally retake Part II because the Examination Regulations require that they must pass Part II within one year of passing Part I. This rule can only be waived in exceptional circumstances, with permission from the Education Committee.

Annex: Summary of marks awarded for different components of the MEM Final Examination in 2012 (For Part I and Part II students who embarked on the FHS respectively in 2010/11 and 2009/10)

	Component	**Mark**
Part I	General Paper 1	100
	General Paper 2	100
	General Paper 3	100
	General Paper 4	100
	Introductory Economics (Ec1)	100
	General Management	100
	Microeconomics	100
	Practicals & Industrial visits	70
	Team Design Project	50
Part I Total		*820*
Part II	Management Project	200
	Materials Options Paper 2	100
	One paper from a choice of Economics and Management Papers.	100
Part II Total		*400*
Overall Total		*1220*

MATERIALS EXTERNAL EXAMINERS' REPORTS

Professor Jon Binner
Dean of the School of Aeronautical, Automotive, Chemical and Materials Engineering and Professor of Ceramic Materials
Loughborough University
2nd July 2012

External Examiners' Report

Department of Materials, Oxford University

Part I and Part II

(i) Whether the academic standards set for its awards, or part thereof, are appropriate;

The standards set by the examiners were entirely appropriate.

(ii) The extent to which its assessment processes are rigorous, ensure equity of treatment for students and have been fairly conducted within institutional regulations and guidance;

From my observation, all students were treated equitably and the assessment process was rigorous. When an issue arose that required careful consideration of the institutional regulations, this was undertaken with great care and attention.

Last year I raised two issues. The first related to the viva and the project report mark and I received a very satisfactory response from the Assistant Registrar; my sincere thanks. My other point related to the industrial site visits, which either get a mark of 100% or zero (the latter if they are not submitted). Given the very variable quality of the reports (some appear to be largely downloaded from the web pages of the company visited), I don't think that it would be a huge amount of extra effort for them to be marked in a slightly more demanding manner, even if this just involved giving them a mark of 0 to 5 out of 5 (with no half marks). The response from the Assistant Registrar indicated that this would be considered by the Materials Teaching Committee (DMAC); I was therefore a little disappointed when, a year later, there was no mention of the outcome of any discussion.

(iii) The standards of student performance in the programmes or parts of programmes which they have been appointed to examine;

It is clear that some students are more capable than others but the result of the examination process was very much in keeping with the ability they displayed. The provision of a viva to all final year students is excellent since it provides every student with the opportunity to demonstrate their ability to the examiners and, in particular, the External Examiners who have not met them before.

(iv) Where appropriate, the comparability of the standards and student achievements with those in some other higher education institutions;

As I have indicated previously:

- For the Part I students, the examinations that were set, the answers that were provided by the students and the marking of those answers were entirely comparable with the standards and achievements of students in the other higher education institutions with which I am familiar.
- It is more difficult for me to make direct comparisons for the Part II students. Our Part II students at Loughborough follow a different path; their individual project is in their 3rd year and their group project in their 4th year. At Oxford, this is reversed allowing the students to really 'go to town' on their individual project. Clearly some students have very much risen to the challenge and some excellent work has been done. I would note, however, that the amount of help provided by the academic supervisor (and their research group) can be very variable. The initial selection of project can, therefore, make quite a difference to how much support the student will see over the duration of the project. Whilst this can never be perfect, a more level playing field would be desirable. The same applies to access to equipment. Some, such as electron microscopy – particularly the FIB – are in high demand by other researchers meaning that some Part II students struggle to get access when they need it.
  Now, the students have to take a lot of responsibility here and plan ahead, but it might be an

idea for the academics to declare when they draft their proposed projects what facilities are going to be needed and for someone to look through them all to see if there are likely to be problems with excess demand for some facilities. We do this at Loughborough and, in some cases, projects are actually modified before the students see the list to reduce demand on key facilities (e.g. our FIB).

(v) Issues which should be brought to the attention of supervising committees in the faculty/department, division or wider University;

As indicated earlier:

- More discriminating marking of industrial site visits;
- Achieve greater similarity in the amount of help provided by the supervisor;
- Put in place a system to reduce the problems of high demand for some facilities.

(vi) Good practice that should be noted and disseminated more widely as appropriate.

I believe that the whole process is performed rigorously and with passion. I always appreciate the chance to meet all of the Part II students and be present at an interview conducted in some depth. I would also like to thank all of the staff involved in the process, who made the experience, which is pretty intense and requires a tremendous amount of reading, as much fun as these things ever can be!

Finally, now that my four years as External Examiner are over, I would like to express my thanks and gratitude to all of the staff and administrators in the Department of Materials who have done an excellent job and would like to commend Philippa Moss in particular for making the process as painless as possible!

Professor Jon Binner
Dean of the School of Aeronautical, Automotive, Chemical and Materials Engineering and Professor of Ceramic Materials
Loughborough University
2nd July 2012

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Professor WM Rainforth, BMet, PhD, FIMMM, FRMS, FInstP, CEng, CPhys
30/6/12

Dear Vice Chancellor

External Examiners Report: Honour School of Materials Science and Honour School of Materials, Economics, and Management, Academic Year 20011/12

In summary, I found the examination procedures, standards and conventions to be all highly satisfactory. The overall standards were excellent. There are some minor comments, addressed below under the specific topics:

i) Whether the academic standards set for its awards, or part thereof, are appropriate

The academic standard set is challenging, but appropriate. The standard within the written examination papers was generally very high. The standard of marking of the written examination papers was rigorous and set high standards. The standard of the Part II theses was largely excellent.

ii) The extent to which its assessment processes are rigorous, ensure equity of treatment for students and been fairly conducted within institutional regulations and guidance

All examinations were marked blind by two independent markers, which ensured absolute equity of treatment for all students. Where marks awarded by the two examiners differed significantly (which was uncommon) appropriate procedures were in place for the moderation. The careful reporting of project management in Part II theses allows a much better comparison of projects concerned with very different topics (e.g. setting standards in a range of theoretical and experimental research topics). The examination process is rigorous and transparent and should be thoroughly commended.

iii) The standards of student performance in the programmes or parts of programmes which they have been appointed to examine

In general, the student performance was excellent. The top students, who were awarded the highest level of degree, were without doubt outstanding and will undoubtedly be a tribute to Oxford University.
The standard of marking was equitable across the all papers. Marking carefully discriminated the difference between standard, good and exceptional students. In the latter case, the student needed to show substantial, in-depth, knowledge of the subject. Attaining a first class degree certainly required an excellent level of achievement.
The Part II theses produced were of variable standard, but could be classed as satisfactory to outstanding, with the majority being at the higher end. Indeed, the top theses were simply excellent, and I would judge to be of the standard of an MPhil degree. In my report 2009/10 I expressed concern that students were too focused in generating results and insufficiently focused in analysing and discussing these results. Last year I felt there had been a clearer indication of close project management and that in most cases the resultant thesis accurately reflected the student ability. The introduction of a page/word limit on the thesis has this year led to a more succinct description of the project, which is to be welcomed. The examiners rightly debate the precision in marking the theses, but it is, of course, far more difficult to assess the supervisors input in to the quality of the student's thesis. However, I believe the current procedures in place are excellent, and the student's achievement is thoroughly assessed in a fair and equitable manner.

iv) Where appropriate, the comparability of the standards and student achievements with those in some other higher education institutions

In general, the level of attainment by the students is in-line with that expected of Oxford University, namely at a higher level that many other higher education institutions. It is difficult to make an absolute comparison as most other Material Science and Engineering degree courses have quite a different structure, specifically they do not include a Part II thesis which involves a full academic year. In any event, I am confident that the student achievement of Materials students at Oxford University is outstanding. Moreover, the depth and breadth of knowledge of the students, resulting from a wide range of challenges set, is without question, excellent.

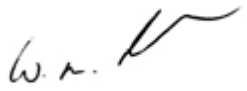
v) Issues which should be brought to the attention of supervising committees in the faculty/department, division or wider University

None.

vi) Good practice that should be noted and disseminated more widely as appropriate

As noted last year, I remain impressed by several aspects of the student experience and examination process. The scope and depth of the part II project is excellent, as is the manner in which students are trained on research equipment for their part II projects. The examination committee, that blind marks examination papers and Part II projects, is an example of excellent practice in ensuring high standards and equitable treatment of all examiners. At the end of the course, the students have received both depth in understanding of the subject and also breadth of experience.

In summary, I would like to congratulate the department on the high standards that they have maintained.



Professor WM Rainforth

Faculty of Materials
Department of Materials Academic Committee

RESPONSE TO EXAMINERS' REPORTS 2012

Honour School of Materials Science (MS) Parts I & II

Honour School of Materials, Economics & Management (MEM) Parts I & II – Materials elements only, main response will be made by the E(M)EM Standing Committee

Following a preparatory meeting between the Chair of DMAC, The Deputy Administrator (Academic) and the incoming and outgoing Chairs of FHS Examiners, the External Examiners' reports, the FHS Chairperson's report and internal reports on all of the individual Materials papers were considered by the Department of Materials Academic Committee (DMAC) and were reported to the Faculty of Materials.

1. Summary of major points

There were no major issues arising from the 2012 Examinations.

2. Points for inclusion in Responses to the External Examiners

MS & MEM Parts I & II: Professor J.G.P. Binner

We thank Professor Binner for his positive report and the time and effort devoted to his role as an External Examiner, not least in reading the Part II MS theses. We would also like to thank him very much for his constructive and thoughtful input over the whole four years of his appointment as one of our external examiners.

In his report on the 2011 Examination Professor Binner suggested that the marking of the Industrial Visit Reports might be more differentiated than the present Pass (5 marks) or Fail (0 marks). After due consultation with the JCCU (staff-student liaison committee) and the Industrial Visits Academic Organiser a proposal was worked up by our Teaching Committee during 2011/12 and was approved by the Faculty of Materials at its meeting in Michaelmas Term 2012. For those students embarking on the FHS in MS and in MEM on or after 1st October 2013, the short industrial visit reports will be marked using a three point scale: 0 (unsatisfactory), 2 (pass), 5 (good).

He has also suggested that advance planning in respect of the facilities, such as electron microscopy, needed for each project would be helpful. Such a scheme, covering both access and training, was introduced in advance of the start of those projects examined in 2011/12, worked well and is now embedded, operating again in 2012/13.

Finally, Professor Binner has suggested that there is a need to achieve greater similarity in the amount of help provided by each supervisor of Part II MS projects. However this concern is not reflected in the report of our 2nd External Examiner, Professor Rainforth, who believes that [despite] the difficulty [when individual projects are part of a degree programme] in judging each supervisor's input to the quality of a student's [work and]

thesis the current procedures in place are excellent, and the student's achievement is thoroughly assessed in a fair and equitable manner. Nonetheless, we shall reflect on Professor Binner's concern as follows:

(i) We do already provide guidance on this matter to students and supervisors (see final paragraph of page 19 and page 26 of the 2012/13 Part II Handbook at http://www.materials.ox.ac.uk/uploads/file/handbooks/2012PART2HBK.pdf), but will consider whether it would be helpful for this guidance to be expanded and/or made more prescriptive. We will also consider whether we can more effectively brief the supervisors on this guidance.

(ii) Equally importantly, by means of Part B of their report, the supervisor's opinion on the amount of help given is made available to all the examiners at the time of the discussion after each viva. The following is an extract from the rubric on this Part B proforma:

> "Please give an overall assessment of the student's work on the project including:
> - the competence and application of the student;
> - the quality of the student's work;
> - the balance between the student's own input to the project and the assistance you or other members of the research team gave the student (including project planning and the write-up of the thesis)"

We will review the content of the 2012 Part B reports and consider whether they are fit for purpose and if they are being used effectively. If appropriate we will modify the rubric on the Part B report and revise the section of the Examination Conventions that provides guidance to the Examiners on the use to which the Part B report is normally put (http://www.materials.ox.ac.uk/uploads/file/MSExaminationConventions2011-12.pdf).

MS & MEM Parts I & II: Professor W.M. Rainforth

We thank Professor Rainforth for his positive report and the time and effort devoted to his role as an External Examiner, not least in reading the Part II MS theses. We are pleased to note his comment regarding the individual MS Part II Projects, "The examiners rightly debate the precision in marking the theses, but it is, of course, far more difficult to assess the supervisors input in to the quality of the student's thesis. However, I believe the current procedures in place are excellent, and the student's achievement is thoroughly assessed in a fair and equitable manner."

MEM Parts I & II, Management Papers: Professor S.M. Wood

We thank Professor Wood for his positive report and for his careful scrutiny of scripts. We concur with his comment that it is of value to Science & Engineering graduates to have the option to study some elements of Management.

MEM Parts I & II, Economics Papers: Prof R.A. Mason

We thank Professor Mason for his positive report and for his careful scrutiny of scripts.

3. Further Points

(a) We have no major comments to make on trends in FHS statistics. Noting the importance of considering averages over five or six years when dealing with small cohorts of students we observe that the proportions of first class and upper second class degrees awarded do not differ greatly from the MPLSD averages. In Materials there continues to be no significant gender gap in the proportions of male and female candidates who gain first class degrees**.**

(b) For the first time since its introduction several years ago we had to apply the regulation that requires a minimum level to be achieved in each element of FHS coursework. Upon the recommendation of the Junior Proctor and with the endorsement of the Chair of Examiners and the Chair of the Department of Materials Academic Committee we shall revise the relevant regulation and associated entries in the Programme Handbook and the Examination Conventions to give greater clarity to this FHS regulation, taking the analogous Materials Prelims Regulation as an example to work from.

(c) When the FHS Examination conventions were updated early in 2011/12 the section covering the viva that forms part of the Part II MS examination was revised to give greater clarity on the purpose and use of the viva.

4. Examination Conventions

We confirm that when updating our Examination Conventions we consider the points in the EdC notes of guidance on Examinations & Assessment, para 3.12, as reproduced in the July 2012 letter from the MPLSD headed 'External examiners' reports 2012'. DMAC and the incoming Board of Examiners will jointly approve the updated conventions. The section in the Prelims Conventions covering the award of Distinctions is to be revised for the 2012/13 Conventions.

A.O. Taylor, Chairman of DMAC, 27/11/12

E(M)EM Standing Committee

Reports from the External Examiners for the Economics & Management Components of MEM Part I & II

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1 August 2012

Vice-Chancellor
c/o Mrs Sally Powell
Assistant Registrar,
University Offices,
Wellington Square,
Oxford OX1 2JD

Dear Mrs Powell,

External examiner's report for Engineering, Economics and Management, and Materials, Economics and Management, academic year 2011-2012

I acted as external examiner (Economics) for these programmes during 2011-2012. Following the guidelines set for examiners, my report covers five main issues.

Whether the academic standards set for its awards, or part thereof, are appropriate.

In my view, the academic standards are entirely appropriate.

The extent to which its assessment processes are rigorous, ensure equity of treatment for students and have been fairly conducted within institutional regulations and guidance.

I am satisfied that the assessment processes met all of these conditions. No substantive issues arose this year.

The standards of student performance in the programmes or parts of programmes which they have been appointed to examine (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).

I was favourably impressed by the standards shown in those scripts that I reviewed. The very best answers were technically very strong indeed.

Where appropriate, the comparability of the standards and student achievements with those in some other higher education institutions.

The students are, on average, as strong as any that I have encountered when examining at other institutions.

Issues which should be brought to the attention of supervising committees in the faculty/department, division or wider University.

Both Exam Boards were very well run this year.

Please do not hesitate to contact me if there is anything else on which you would like me to comment.

Yours sincerely,

Professor Robin Mason
Dean

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Professor Steve Wood
BA (Hons); PhD; PGCAP

Professor of Retail Marketing and Management

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9th July 2012

Mrs Sally J. Powell
Assistant Registrar
Education Policy Suppo
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Dear Mrs Powell,

External Examiner's Report: Management

I am pleased to present a report on my first year as external examiner for the Management components of programmes across Management/Economics, Engineering and Materials. In the course of my role, I have attended the following examination boards:

1. Materials, Economics and Management (MEM) Exam Board (29th June 2012)
2. Engineering, Economics and Management Classification Exam Board (29th June 2012)
3. Economics & Management Exam Board (6th July 2012)I

structure my report in accordance with the suggested headings:

- **Whether the academic standards set for its awards, or part thereof, are appropriate.**

Yes. The assessment set is appropriately challenging and thereby provides the opportunity for the more able students to excel and for Faculty to differentiate between levels of ability and performance. The assessment offers a suitable balance between academic theory, critical analysis and the application to management practice.

(ii) The extent to which its assessment processes are rigorous, ensure equity of treatment for students and have been fairly conducted within institutional regulations and guidance.

The assessment process is rigorous and robust. By opting to use double blind marking, along with discussion and agreement where there are differences between assessors, all student work is thoroughly appraised. During the exam boards all students receive an appropriate degree of consideration: candidates are anonymised and Faculty seek external examiner views on borderline cases. External examiners are provided with all of the resources necessary to understand student performance and assessment.

(iii) The standards of student performance in the programmes or parts of programmes which they have been appointed to examine (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).

Student performance was extremely strong with only a very short tail of less developed work. For the most part, candidates demonstrated good knowledge of theory and exhibited the ability to critically appraise both theory and practice.

I am pleased that engineering and materials students have the opportunity to take management modules - not least given that their future careers will require such a skill-set. Student performance was impressive across both faculties.

(iv) Where appropriate, the comparability of the standards and student achievements with those in some other higher education institutions.

In general, the performance of students is similar to the quality a t the top end of ability range that I have seen a t universities elsewhere - the difference a t Oxford appears to be the smaller "tail" of less accomplished performance. A t the very top end of student performance a t Oxford, truly exceptional ability is evident - something especially impressive given the challenging nature of the Finals examination period.

(v) Issues which should be brought to the attention of supervising committees in the faculty/department, division or wider University.

Faculty should be congratulated on developing a fine cohort of student performance in the final examinations. The process for the setting of examinations and the subsequent assessment is tight, fair and consistent.

(vi) Good practice that should be noted and disseminated more widely as appropriate.

See above.

If you have any further queries, please feel free to contact me on sm.wood@surrey.ac.uk

Yours sincerely

Steve Wood
Professor of Retail Marketing and Managemen

Minutes of the discussion of Examiners' Reports at the EMEM Standing Committee

STANDING COMMITTEE FOR EEM AND RELATED STUDIES

Part II – Reserved Minutes of the meeting held on 25 October 2012

11 Internal and External Examiners' Reports for Examinations in 2012

11.1 Chairman's Report for EEM Parts A, B and C

The Standing Committee received the Chairman's Report for EEM Parts A, B and C. No matters of concern were raised.

11.2 Chairman's Report for Engineering Science Parts A, B and C

The Standing Committee received the Chairman's Report for Engineering Science Parts A, B and C for information.

11.3 MEM Parts I and II

The Standing Committee received the examiners' reports for MEM Parts I and II. No matters of concern were raised.

11.4 External Examiners' Reports

The external examiners' reports were received from:

- Engineering: Professors Dugwell, Hanzo and Powrie.
- Economics: Professor Mason
- Management: Professor Wood
- Materials: Professors Binner and Rainforth

The Standing Committee was pleased to note the overall complimentary nature of the comments from the external examiners. On the basis of comments on the 2011 examination process, a pre-classification meeting of the internal examiners had been introduced in 2012 at which the examiners had been able to agree policy regarding any necessary adjustment of marks. This had enabled the meetings the following day to be devoted to agreeing the final outcomes through discussion of borderlines and classification. The intention was to continue with this practice, but in response to further comments on this matter the need for more time between the meetings had been taken on board in the planning for the 2013 examinations.